FAWCETT'S

MODERN MECHANICS AND INVENTIONS

MAY 25c

STEWAR ROUS

IN THIS ISSUE

CARS WITH MOTORS IN THE WHEELS

MECHANICS OF LION TAMING

2-PASSENGER PLANE FOR $500

A BULLET PROOF ROTOR PLANE

SEE PAGE [illegible]

Inventor Produces Mysterious "Gas Bug"

That Will Save Gasoline

And Does 44 Other Amazing Things for Your Car

Here's a creation so utterly amazing in its action and results that it sounds almost like fiction. Yet it exists as a scientific fact—already tested by engineering authorities and on thousands of cars. It has been called "the strangest acting auto discovery under the sun," for it puzzles even shrewd minds. A mysterious discovery called "Gas Bug"—an uncanny "miracle" fluid that "crawls" and "climbs" as though filled with invisible life. Not a gasoline dope, carburetor device, electrical apparatus or other "contraption." No wonder agents are offered such big money making possibilities thru our plan of giving car owners Free Sample Demonstrations that do a vital engine job absolutely Free for owners—a job any mechanic would charge up to $10 or $12 to do.

In 3 Minutes

More Power—Speed—Pep

The 4 vital engine improvements that motordom has always striven for may be actually realized—increased gas mileage, reduction of the many engine evils that cost motorists millions, increased engine efficiency and many more miles of engine service. Saves money in gas, engine repairs, upkeep, wear and tear, valve grinding, carbon removing and many other ways. In 3 minutes you see amazing results—more power, more speed, more pep, smoother running engine. Loosens carbon. Valves operate snappier, faster, more accurately. Winter starting is easier. Missing, hucking, carbon knocks and spark plug troubles diminish. *If "Gas Bug" does not save enough gasoline to pay for itself many times—and do every one of the other 44 amazing things we claim—it will cost you nothing.* You be the judge.

Now Make Up To

$35 a Day

Without Leaving Your House For Prospects. New Plan puts You in a Mail Order Business of Your Own at Home.

NO CANVASSING

For Prospects

This queer discovery has proved so sensational in results and offers agents such big, quick money possibilities that no one less than the United States Motor Industries itself has taken it over and backs it with its own warrantees. Now, at last, the dream of nearly every agent has come true! A plan to make big money quick without personal "cold turkey" canvassing for prospects—yet, without even leaving your house. Stay at home and let the mails get the prospects for you. The newest, fliest plan we have heard of in years. We actually start you in a "Mail Order Business" of your own, at home, in full or spare time—on our warrantee given to protect you against moneyloss. You mail out free sample demonstration offers to motorists in your territory. Then watch your profits begin to roll in—up to $35 a day right from the start. We furnish you with these samples, powerful Circulars, return Post Cards with your name imprinted, Enclosed, Order Blanks—all the mail order literature needed to start this sensational plan—all without extra charge to you. So wonderful are the results of "Gas Bug" that we make it possible for agents to share it with motorists on 30 days' trial without risk to them. No wonder "Gas Bug" offers agents such a big-money opportunity.

Cash Pay

FOR MERELY DEMONSTRATING

Every car, truck and tractor owner in the country needs this amazing discovery so quick that we do the unheard-of to get you started at once. On another daring starting offer we actually pay you cash for merely demonstrating and giving away the samples to motorists free that do a vital engine job worth up to $10 or $12, FREE. No need to make sales to get this pay. But that is not all we do—we even pay you an extra cash forfeit if you don't satisfy yourself that "Gas Bug" offers you up to $35 a day.

$100 REWARD

We do as we promise! We will pay $100.00 cash reward to any worthy charity if anyone can show that we do not fulfill every offer we make to our agents.

SAMPLE OFFER

So that you can test the outstanding merits of this amazing discovery and to start you quick as our big money making agent, we will send you our generous introductory offer of a complete "Gas Bug" outfit for your own car. Just rush coupon. Send no money. Nothing will be sent C. O. D.

$1.00 Cash Bonus for Testing It

If "Gas Bug" doesn't do everything we claim, we will actually pay you a cash bonus for trying it. We expect this sensational announcement to bring thousands of applications for these big money openings. So rush coupon. United States Motor Industries, Inc., 311 North Desplaines St., Dept. 155, Chicago, Illinois.

United States Motor Industries, Inc.,
Accessory Division,
311 North Desplaines St., Dept. 155, Chicago, Illinois.

Without cost or obligation to me, rush generous introductory sample offer; offer of $1.00 Cash Bonus for testing it, plan that lets me start in a "Mail Order Business" of my own at home; Warrantee of cash pay for merely demonstrating, and Details of Cash Bonus if your plan doesn't show me $35 a day possibilities. This is not an order. Send nothing C. O. D.

Name .....

Address .....

City ..... State .....

Harmonica "AL" *and his musical pal*

One rainy Saturday all the crowd were in Bob's garage when Bill suggested a show. "But what will we do for music?" said Bob. Then up spoke Al, the new boy in the neighborhood, rather timidly. "I'll play my harmonica."

They all snickered when they heard what Al said, for in school Al couldn't play or sing a note. Even Mary who had been so nice to him laughed. But Al only smiled and said "Just you wait."

The show was on. Mary's, Bill's and Bob's acts were fronts. The audience was beginning to jeer when Al appeared with his harmonica. How they clapped and cheered when he finished! Al was the hero of the day.

After the show all gathered around Al eager to know how he learned to play. Drawing a little booklet from his pocket Al said, "It's a cinch to learn with this book, and it's free, too. Why don't you send for one—and we'll all play together."

AL ALWAYS found it difficult to make friends. He was never noticed at parties because there was nothing he could do to entertain others. He was always lonesome. When he moved into a new neighborhood or went to a different school, it was weeks before he was ever invited to play with the rest of the crowd.

One day he saw an advertisement that said the Harmonica was the easiest of all instruments to play, and offered him a FREE BOOK of Instructions. Al sent away for the Book and sure enough, to his amazement, in a few days he was playing—and playing well. It was so simple—it was just like learning a game. Today, Al is the leader of the crowd, no matter where he is. He never has a lonesome moment. When he goes to parties, he's the star performer. All the boys and girls think he's wonderful.

Free Instruction Book

If you haven't the knack of making friends, if you want to be the leader of your crowd, why don't you learn to play the harmonica? Send for the FREE Harmonica Instruction Book. It's all so easy you'll be amazed at the expert way you can play in a short time.

Harmonica Bands Great Fun

Want to know what's even more fun than playing the harmonica alone? Start a harmonica band among your schoolmates!

All over the country, up-to-date boys and girls are forming bands and having a great time besides winning fame playing over the radio, at entertainments, school assemblies and on the stage. If you want to start a band, ask your Teacher or Scout Master to send for the booklet that will tell all about it. Meantime be sure to send for the Free Illustrated Harmonica Instruction Book and learn to play.

A Quality Instrument

Hohner Harmonicas are the choice of professionals everywhere, and while slightly higher in price than inferior instruments, you always have the satisfaction of knowing you own the best—one that enables you to play anything from jazz to opera. You can get Hohner Harmonicas everywhere, in many different styles—at all prices. Send for Free Instruction Book—Fill out coupon now and mail it AT ONCE to M. Hohner, Inc., 114 E. 16th St., Dept. 107-E, New York City.

HOHNER
Harmonicas

M. Hohner, Inc., 114 East 16th St.,
Dept. 107-E, New York

Please send me at once FREE Illustrated Instruction Book which tells me how to play the harmonica.

Name .....

Address .....

City ..... State .....

A FAWCETT MAGAZINE
Other Fawcett magazines are Screen Play, Triple-X, Battle Stories, Mystic Magazine, Hollywood, and The Amateur Golfer and Sportsman.

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MODERN MECHANICS AND INVENTIONS

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May, 1931

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They Told Him Salesmen Were "Born"

But Now He Makes $10,000 a Year ...Thanks to This Little Book

IT was just a little free book that made the difference between Ed Pinkham and the rest of the men in our shop. Nobody ever imagined that Ed would land, even in the $5,000-a-year class, let alone be making $10,000 before he was thirty. Ed didn't know himself the abilities he had in him as a money-maker.

But one day, a strange occurrence changed his whole life. During his lunch hour Ed started to read a little book he had brought to work with him.

"It's a book called 'The Key To Master Salesmanship,' Bill," he told me. "It's the most amazing thing I ever read. I never dreamed there was so much in salesmanship. You ought to send for a copy yourself. It's free."

"Huh!" said Luke Jones. "Does that book tell you how to become a salesman?"

"It sure does," replied Ed, enthusiastically.

"Don't waste your time," advised Luke. "You can't learn how to be a salesman. A fellow has to be 'born' that way to be a good salesman."

Ed just smiled at that, but he said nothing. Soon afterward he quit the shop, and we forgot about him. And then last night, I met Ed again—driving a snappy new sedan and dressed like a million dollars.

"For Pete's sake," I said. "What are you doing nowadays, Ed?" He smiled. "City salesmanager for the Steel Castings Company," he told me. "What are you doing?"

"Still at the shop," I replied. "But what I want to know is, how do you come to be salesmanager for Steel Castings? They're one of the biggest firms in the business."

Ed smiled again. "Remember that book on Salesmanship that Luke Jones was kidding me about one day? Well, when I finished my Salesmanship training the Association I took it from gave me a choice of twenty-one jobs through their Free Employment Department. I got a wonderful job, and I had a wonderful training so I've had a pretty successful time of it. They made me City Sales Manager three months ago at ten thousand dollars a year."

"Good night!" I said. "And Luke and I are still punching the old time clock!"

Ed looked at me seriously. "See here, Bill," he said. "Are you sport enough to risk two cents that you can do as well as I did? Then spend the two cents to write to the National Salesmen's Training Association tonight and get their free book. Then take their course. When you are qualified, their Free Employment Department will help you get a good sales job—every year they have calls for over 50,000 salesmen. Not only will they help you get the job but they give you an iron-clad money-back guarantee that you must be satisfied with the training received—or they refund your tuition!"

FREE—TO EVERY MAN

A book—but what a book! Just seven ounces of paper and printer's ink—but it reveals facts and secrets that have led hundreds of men to success beyond their fondest expectations! See for yourself—FREE—why "The Key To Master Salesmanship" has increased the earning capacities of thousands, as a direct result of their reading it! You'll know them, how J. H. Huppert of Michigan learned from its pages the secrets that enabled him to make $525 in one week. You can understand how it helped A. A. Fidler of Alabama to raise his pay 700%. Learn for yourself the REAL TRUTH about salesmanship. You do not risk one penny or incur the slightest obligation. And since it may prove the turning point in your career it is certainly worth your while to fill out and mail the coupon below. Do it now!

NATIONAL SALESMEN'S TRAINING ASSOCIATION,
Dept. E-703, N. S. T. A. Bldg.,
Chicago, Ill.

Now Sent FREE

National Salesmen's Training Association,
Dept. E-703, N. S. T. A. Bldg., Chicago, Ill.

Without cost or obligation please send me my free copy of "The Key To Master Salesmanship," including details of your FREE EMPLOYMENT Service.

Name .....

Address .....

City ..... State .....

Age ..... Occupation .....

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Edited by Experts

Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

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Chief of Staff

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Former Assistant Chief, U. S. Air Service

Pilot Gene Shank
Famous Aviator, Holder of Light Plane Endurance Flight Record

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Naval Architect

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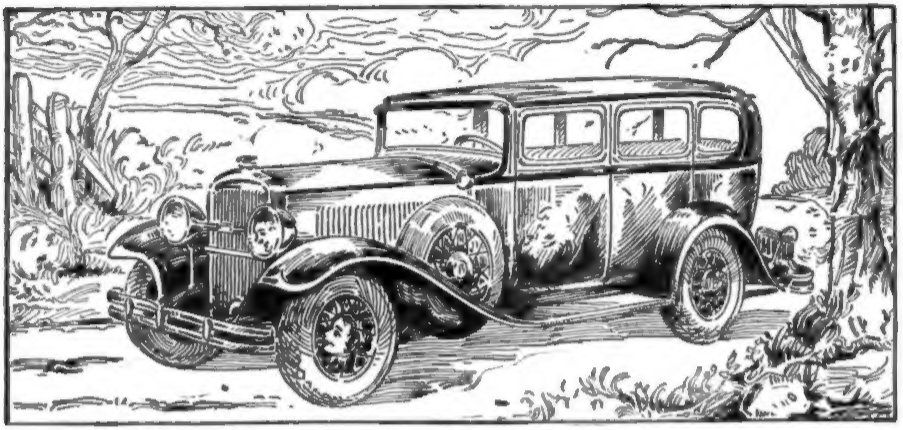
Jay Earle Miller
Associate Editor and Chicago Correspondent

Bob Gordon
J. Russell Dye
Associate Editors

Win $2,500.00

or Buick Sedan and $1,000 Cash!



Can you find 5 faces in the picture

Sensational money-making opportunity for everybody! You may win this handsome latest model Buick 8 Sport Sedan—delivered to your door by your nearest dealer—and $1,000 extra for promptness, or $2,500 if you desire the cash instead. **This offer is made by a prominent business house for advertising purposes. Someone is going to win $2,500—why not you?**

I want to send you this prize. Act quick! Send your answer today and qualify to win.

All you do to qualify in this great cash prize advertising plan is to find five faces in picture.

People riding in the auto above got out of the car. Their faces are shown in odd places about the picture. Some faces are upside down, others look sideways, some look straight at you. If you can pick out 5 or more faces, mark them, clip the picture and send to me together with your name and address. Sharp eyes will find them. Can you?

$5,062.50 in 140 Cash Prizes .... Easy to Win

Someone wins the latest model Buick 8 Sedan and you are sure to profit if you take an active part. In case of ties duplicate prizes will be given. In addition to the Grand Prize of $1,500 in cash, or the Buick Sedan, and $1,000 extra for promptness, there are 139 other wonderful cash prizes. Second Prize $750 cash, Third Prize $500 cash, and so on. All told $5,062.50 in cash. Money to pay you is already on deposit in the Mercantile Trust and Savings Bank, a big Chicago bank.

Send No Money

The main thing is—send in your answer today. You can share in this advertising cash distribution. Hurry! and take no chance of losing the extra reward of $1,000 for promptness if you win first prize. Act now! You don't need to send a penny of your money to win! Just find five faces in the picture above and mail with coupon at once for particulars.

$1,000.00 for Promptness

Send your answer at once. Make sure to qualify for $1,000 extra given for promptness if you win the Buick Sedan—a total of $2,500 if you prefer all cash.

Send Coupon Today

ALAN GRANT, Mgr.
427 W. Randolph St., Dept., 235, Chicago, Ill.

I have found five faces in the $2,500.00 prize picture and am anxious to win a prize. Please advise me how I stand.

Name.....

Address.....

Town..... State.....

Indiana Farmer Wins $3,500!

This is a picture of Mr. C. H. Essig, Argos, Ind., taken on his farm. He writes: "Wish to acknowledge receipt of your $3,500 prize check. Oh, boy! This is the biggest sum of money I ever had in my hands. It is indeed a fortune to me."

Hundreds have been rewarded in our past advertising campaigns. Mrs. Edna D. Ziler, of Kentucky, won $1,950. Miss Tillie Bohle, of Iowa, $1,500. Be Prompt! Answer today!

We have placed machinists, carpenters, masons, plumbers, railroad men, office clerks, farmers and even laborers in fine Drafting Jobs under this plan. Mail coupon for details of our remarkable offer.

Men Who Work With Their Hands
Make the Best
DRAFTSMEN

—and we'll back them with this EMPLOYMENT CONTRACT

We are looking for more ambitious young fellows with factory, building-trade or any other kind of mechanical experience to prepare for and help place in well-paid Drafting positions. Such men, we find, are unusually successful as Draftsmen, because they know how things are done, and that's a priceless asset to the man who makes the blueprint plans. Get in touch with me and I'll tell you how you can cash in on your entire past mechanical experience.

"I have landed a job with the Pacific Tel. and Tel. Co. in Seattle, and I must say that I am greatly indebted to the American School for my success. You have done all that you promised in helping me obtain employment."
T. C. White
Seattle, Wash.

"I have obtained a position as a junior draftsman with the Muncie Oil Engine Co., and so far I like the work real well. I appreciate your aid in obtaining this position very much."
M. N. Barcham
Muncie, Ind.

Drafting Is Logically Your Next Move!

Of course you realize the biggest handicap to mechanical work is that you're limited in earning capacity to the output of your two hands, as long as you live. Even the skilled mechanic earning $50 to $60 a week has reached his limit. He can never earn more and when he gets old he will earn **less**. So I don't blame any man for wanting to get away from this futureless outlook. For wanting to get into something where he can use his **head** as well as his hands—where he will be paid for what he **knows**, instead of only for what he **does** . . . You know enough about blueprints to understand that PLANS govern every move in factory and construction job. The Draftsman who makes them is several jumps ahead of the workman who follows them. And so I want you to know that DRAFTING is a logical, natural PROMOTION from mechanical and building work—better-paid, more interesting—just the kind of work you'd enjoy doing.

Get Our NO-RISK PLAN

The way to a fine Drafting job for you—is easier than you think. It takes no "artistic talent" or advanced education. Thousands of men no smarter than you, with no more education or ability, have learned it quickly and you can, too. With the co-operation of some of the biggest employers and engineers in the U. S., we have worked out a plan to prepare you for Drafting work in your spare time at home—then to help you get a fine position *when you're only half way through the course*. Mail the coupon and we'll be glad to tell you all about this lifetime chance.

THE AMERICAN SCHOOL
Dept. D-533, Drexel Ave. and 58th St., Chicago, Ill.

36-Page Drafting Book—FREE

Tells how easy Drafting is to learn—how interesting the work is—what remarkable opportunities are open for Draftsmen right now. Mail coupon for a copy—without cost or obligation.

AMERICAN SCHOOL, Dept. D-533, Drexel Ave. and 58th St., Chicago, Ill.

Please tell me, without cost or obligation, about your training and employment service in line marked X below.

☐ DRAFTING

- ☐ Architecture
- ☐ Civil Engineering
- ☐ Building
- ☐ Auto Engineering
- ☐ Electrical Engineering
- ☐ Business Management
- ☐ Accounting
- ☐ Mechanical Engineering
- ☐ Shop Superintendent
- ☐ Foremanship
- ☐ High School in 2 years
- ☐ Structural Steel

Name_____

St. No._____

City_____ State_____

Age_____ Occupation_____

TO THE CLASS OF '29

IF YOU started a career after finishing high school, you've had time to realize a few things by now. Do you ever wonder why you are not getting ahead faster and earning more money? Do you speculate on what the future holds for you?

Look about you — those who are making progress and getting the increases in pay are the *trained* men! This is an age of specialists. Deprived of college degrees by circumstances, many ambitious men today use high-school education as a beneficial background in acquiring the *specialized training* they need most. So can you!

International Correspondence Schools can do for you what it has done for them. All over the world high-school graduates are acquiring the practical knowledge they need from this 40-year-old institution. "Based on personal experience," says Jos. E. Driscoll of Roanoke, Va., "my advice to every young man and woman who cannot attend college is to take an I. C. S. course on the line of work they wish to follow." Marking the coupon below may be far more important to your earning power than the day you received that high-school diploma.

Challenge us to help you!

INTERNATIONAL CORRESPONDENCE SCHOOLS

INTERNATIONAL CORRESPONDENCE SCHOOLS, *"The Universal University,"* **Box 2318-L, Scranton, Penna.**
Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Estimating
- ☐ Wood Millworking
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Electric Wiring
- ☐ Electrical Engineer
- ☐ Electric Lighting
- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machinist
- ☐ Toolmaker
- ☐ Patternmaker
- ☐ Pipefitter ☐ Tinsmith
- ☐ Bridge Engineer
- ☐ Bridge and Building Foreman
- ☐ Gas Engines
- ☐ Diesel Engines
- ☐ Aviation Engines
- ☐ Automobile Mechanic
- ☐ Plumbing ☐ Steam Fitting
- ☐ Heating ☐ Ventilation
- ☐ Sheet Metal Worker
- ☐ Steam Engineer
- ☐ Steam Electric Engineer
- ☐ Civil Engineer
- ☐ Surveying and Mapping
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- ☐ R. R. Bridge and Building Foreman
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- ☐ Highway Engineering
- ☐ Chemistry ☐ Pharmacy
- ☐ Coal Mining Engineer
- ☐ Navigation ☐ Boilermaker
- ☐ Textile Overseer or Supt.
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture ☐ Fruit Growing
- ☐ Poultry Farming ☐ Radio
- ☐ Marine Engineer

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Office Management
- ☐ Industrial Management
- ☐ Personnel Management
- ☐ Traffic Management
- ☐ Accountancy ☐ Cost Accountant
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Why work at dull, uninteresting work, at low pay, with no future. In 12 weeks I will train you for a big pay job where you can learn to earn $60.00 to $200.00 a week as a COYNE-TRAINED PRACTICAL ELECTRICIAN, and then my employment dept. will assist you in getting a big pay job or you can go in business for yourself with very small capital and make up to $15,000 a year. Men trained as I train them in the great shops of Coyne are in demand everywhere. The great development of the Electrical industry makes the demand for COYNE-trained men tremendous. Big opportunities and advancement for those who prepare now.

32

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The Coyne School was founded 32 years ago and my thousands of SUCCESSFUL GRADUATES are living proofs of what my training can do for ANY AMBITIOUS MAN. Many of these fellows will tell you in the pages of my big free book what COYNE has done for them.

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I train you thoroughly on the greatest outlay of ACTUAL ELECTRICAL MACHINERY ever assembled in any school. You work with your hands on all kinds of Electrical apparatus, door bells, house wiring, armatures, switchboards, dynamos, everything to make you an all around ELECTRICIAN. This REAL WORK with REAL tools on REAL machinery trains you many times FASTER, many times MORE THOROUGH than any other method. It stands to reason, there is no substitute for practical training.

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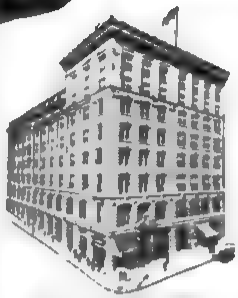

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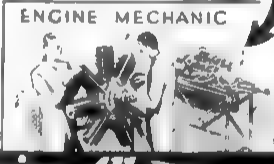

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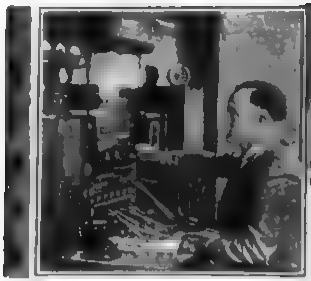


Broadcasting Stations offer fascinating jobs paying from $1,800 to $5,000 a year

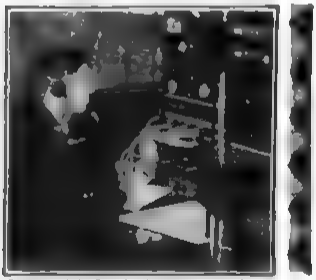
You're Wanted

Take your pick of these fine Big Pay Radio Jobs

YOU have seen how the men and young men who got into the automobile, motion picture and other industries when they were started had the first chance at the key jobs—are now the $5,000, $10,000 and $15,000 a year men. Radio offers you the same chance that made men rich in those businesses. Its growth has already made men independent and will make many more wealthy in the future. Its amazing growth can put you ahead too. Don't pass up this opportunity for a good job and future financial independence.

Operating [illegible] world-wide travel [illegible] salary of $[illegible]

Spare time set servicing is paying N. R. I. men $200 to $1,000 a year for their spare time. Earnings begin almost at once after enrolling.



Commercial Land Stations are being opened very rapidly in our leading cities. Trans-Oceanic telephony offers many attractive jobs.

Radio factories employ thousands. Salaries for well trained men range from $1,800 to $5,000 a year

Hundreds of $50 to $100 a Week Jobs Opening Every Year

Radio needs more trained men badly. Why slave your life away for $25 to $40 a week in a no-future job when you can get ready in a short time for Radio where the good jobs pay $50, $60, $75 and $100 a week? And many of these jobs can quickly lead to $150 to $200 a week. Hundreds of fine jobs are opening every year for men with the right training—the kind of training I'll give you.

I Am Doubling and Tripling Salaries

Where you find big growth you always find many big opportunities. I am doubling and tripling the salaries of many men every year. After training with me only a short time they are able to make $1,000 to $3,000 a year more than they were getting before. Figure out for yourself what an increase like this would mean to you—the many things that mean so much in happiness and comfort that you could buy with an additional $1,000 to $3,000 a year.

Many Make $10 to $25 a Week Extra Almost at Once

The day you start I'll show you how to do ten jobs common in most every neighborhood that you can do in your spare time. I'll show you how to repair and service all makes of sets and do many other jobs all through my course. I'll give you the plans and ideas that are making $200 to $1,000 for my students while they are taking my course. G. W. Page, 107 Raleigh Apts., Nashville, Tenn., writes: "I made $935 in my spare time while taking your course."

You Have Many Jobs to Choose From

Broadcasting stations use engineers, operators, station managers. Radio manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers and managers. Shipping companies use hundreds of operators and give them world-wide travel with practically no expense and a good salary besides. There are hundreds of opportunities for you to have a spare time or full time Radio business of your own. I'll show you how to start one with practically no capital. My book tells you of other opportunities. Be sure to get it at once.

$400 a Month

"I spent fifteen years as traveling salesman and was making good money but could see the opportunities in Radio. Believe me I am not sorry, for I have made more money than ever before. I have made more than $400 each month and it really was your course that brought me to this. I can't say too much for your school."—J. G. Dahlstead, 1484 South 15th St., Salt Lake City, Utah

$800 in Spare Time

"Money could not pay for what I got out of your course. I did not know a single thing about Radio before I enrolled but I have made $800 in my spare time although my work keeps me away from home from 8:00 A. M. to 7:00 P. M. Every word I ever read about your course I have found true."—Milton I. Leiby, Jr., Topton, Pennsylvania.

Seldom Under $100 a Week

"My earnings in Radio are many times greater than I ever expected them to be. In November I made $577, December $645, January $465. My earnings seldom fall under $100 a week. I'll say the N. R. I. course is thorough and complete. You give a man more for his money than anybody else."—E. E. Winborne, 1414 W. 48th St., Norfolk, Va.

for a Big Pay Radio Job

I will train you AT HOME
free book gives facts and proof

I Will Train You at Home In Your Spare Time

Hold your job. There is no need for you to leave home. I will train you quickly and inexpensively during your spare time. You don't have to be a high school graduate My course is written in a clear, interesting style that most anyone can grasp. I'll give you practical experience under my 50-50 method of training — one-half from lesson books and one half from practical experiments. When you graduate you won't have to take any kind of a job to get experience—you will be trained and experienced ready to take your place beside men who have been in the field for years.

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My course not only gives you a thorough training in Radio — all you need to know to get and hold a good job—but also your choice, without extra charge, of any one of these special courses: Television, Aircraft Radio, Broadcasting, Commercial and Ship Radio Stations, Sound Pictures and Public Address Systems, and Advanced Radio Servicing and Merchandising. You won't be a "one job" man when you finish my course. You'll know how to handle a job in any one of Radio's 20 different branches of opportunity.

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When you finish my course you won't be turned loose to shift for yourself. Then as when I will step in and help you find a job through my Employment Department. This Employment Service is free of extra charge both to you and the employer. My Employment Department is getting three times as many calls for graduates this year as last year

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Find Out What Radio Offers You—Get My Book at Once

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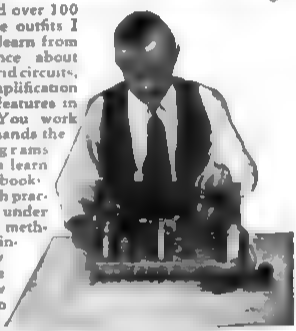
I give You 8 Big Outfits of Radio parts for a home Experimental Laboratory



You can build over 100 circuits with the outfits I give you. You learn from actual experience about A C., Screen Grid circuits, push - pull amplification and the other features in modern sets. You work out with your hands the principles, diagrams and circuits you learn from my lesson books. You get as much practical experience under this unequaled method of home training, in a few months, as the average fellow gets in two to four years in the field.

J. E. SMITH, President

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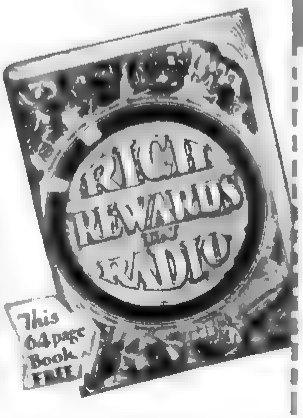
"Before I completed your course I went to work for a Radio dealer. Now I am Assistant Service Manager of the Sparks-Withington Company. My salary is three times what it was before taking your course. I could not have obtained this position without it. I owe my success to N R I. training." H. A. Wilmoth, Sparks - Withington Co., Jackson, Mich.



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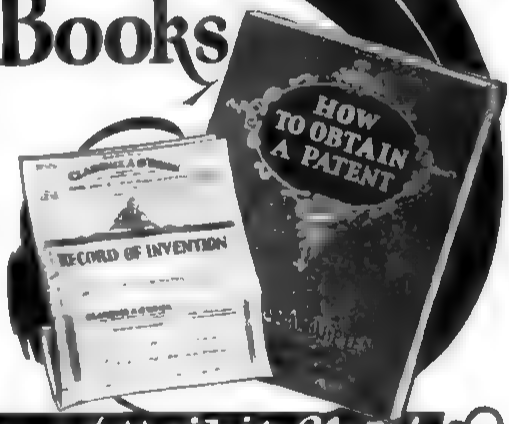

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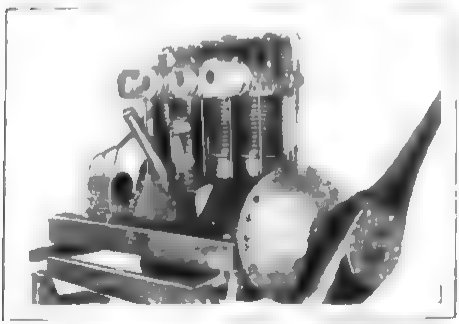
(Important—Write or print plainly, and address office nearest you)

The Aviation Club of the Salamonie High School of Warren, Indiana which designed and built its own light plane and an engine made from motorcycle parts. From left to right are: Clarence Moore, Kenneth Sheets, George Spahr, Robert Pulley, Herschel Ruble, who designed the motor, C. G. Reynard, Instructor, Billy Wearley who received a Boy Scout merit badge for his work, John Smethers, Dwight Trout and John Ruble. The original motor will be placed on a Heath Super-Parasol.

Andy's Shop Mail Box

Andy, the Prince of Propwash and the patron saint of Double M fans, each month staggers into the hangar with a load of true confessions from his royal retinue and passes the best on to you.

HELLO, GANG! Now that you've seen the first instalment of the Pietenpol job, what do you think of her? If my mail is any criterion, there won't be a Model A on the ground within a month after the last instalment is published. Incidentally, if you don't want to wait for that last spasm to appear in print, you can get a complete set of blueprints by sending three-quarters of a saw-buck to the eds or myself. I'll publish the first picture I receive of a completed job.



An air cooled aero conversion for Chevrolet and Ford motors, built by Rathel Electric Company.

IF YOU'VE been reading my line very long you will remember that some months ago I ran a picture of a neat little biplane built by the Rathel Electric Co., of Daleville, Ind. Since then I have received some more dope from them which I am passing along, knowing that there are plenty of fans who have been waiting for something just like this. Here are a few random shots from Fred Rathel's missive:

—As we said before, we are interested in the junior flyer, and he is welcome to the results of three years' experimenting on our part. Our new monoplane is a dandy and seems to be ideal with either the Ford A prestone cooled motor or our own air cooled converted Chevrolet motor.

The Rathel motor is built on either a 27 or 28 Chevrolet cylinder block. It develops 45 horsepower and weighs 194 lbs., ready to fly. The gas consumption is 2½ gallons an hour wide open.

Our Model A engine is equipped with a high compression aluminum head. It turns 60 horsepower at 2,400 revs and is equipped with a small radiator for prestone cooling. It weighs, ready to fly, only 248 lbs.

Any part or any group of parts, either

(Continued on page 22)

Think of it! Genuine UNDERWOOD

Yours for 10 Days TRIAL

Refinished

Regular $100. Model **Now Only 39.90**

Yes—this world-famous Underwood is yours for full 10 days. See for yourself the ***real bargain*** it is. See how beautiful and new it looks—compare its neat, perfect work—without obligation.

Buy Direct at Below ½ Mfg's Original Price

Now Only $ DOWN on Easy Terms

My unchallenged direct sale price and easy terms on this genuine Underwood refinished No. 4 is the lowest ever offered. While they last—less than half (½) the manufacturer's original price—and easy terms besides. Do not confuse this genuine late model Underwood with inferior or frail machines worth only one-half as much. This is the full sized standard Underwood with 4-row keyboard and late improvements, manufactured to sell originally for $100. ***Fully Guaranteed*** in writing.

Limited Quantity — Send at Once!

This exceptional bargain offer is for a very limited time only. Remember, every typewriter is sent on 10-days' Trial and Fully Guaranteed.

12 REASONS WHY this is the Greatest Value Ever Offered

1. Genuine Underwood
2. Standard 4-row Keyboard
3. 2-color Ribbon
4. Back Spacer
5. Ribbon Reverse
6. Tabulator
7. Automatic Release
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9. Lowest Price
10. Easiest Terms
11. 10-Day Trial
12. Fully Guaranteed.

FREE Complete 9-Piece Office Supply Set and Typewriting Course

We teach you speed typewriting Free. Complete Home Study Course of the Famous Van Sant Speed Typewriting System, fully illustrated, easily learned. We also give complete office supply set free during this sensational sale.

Easy Terms—Only 10c a Day!

Think of it—a genuine late model Underwood reduced to $39.90 (Cash). A saving of over $60 by acting now. Send only $1 deposit for a 10-day Trial. Then only 10c a day on my easy year-to-pay plan. And you use and enjoy your typewriter all the time. This Underwood all refinished like new is without question the greatest value ever offered at this rock-bottom price. (See column to left for its many outstanding features and improvements.)

International Typewriter Exchange,
231 West Monroe St., Chicago, Ill., Dept. 504.

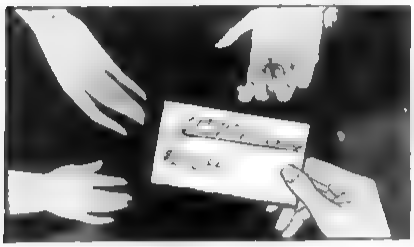
I am enclosing $1.00 deposit. Please send the Underwood No. 4 F O B Chicago at the special reduced price for 10-day Trial, with the understanding that if I am not perfectly satisfied I can return it Express Collect and get my deposit back. If I keep it I will pay $3 a month until I have paid $44.90 (term price) in full.

Name . . . Age . . .

Address

Town . . . . . State .

How many hands REACH FOR YOUR SALARY?



WHETHER you are married or single there are loved ones at home who look to you for everything that makes life worth while.

With responsibilities increasing, what are you doing to qualify for the kind of a job that will pay you more money?

To *earn* more you must *learn* more — either about your present job or some other.

The International Correspondence Schools at Scranton, Pa. can prepare you for one of these good jobs right in *your own home* during your *spare time*. Thousands of I. C. S. students are today living in fine homes, surrounded by the comforts of life, who a few years ago could scarcely afford the bare necessities. What these men have done YOU *can do*.

Just mark and mail the coupon below. Without obligating you in the least, let the I. C. S. show you how they can help you win promotion!

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 2319-L, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject before which I have marked X.

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- ☐ Architect
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- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machinist ☐ Toolmaker
- ☐ Patternmaker
- ☐ Pipefitter ☐ Tinsmith
- ☐ Bridge Engineer
- ☐ Bridge and Building Foreman
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- ☐ Aviation Engines
- ☐ Automobile Mechanic
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- ☐ Sheet Metal Worker
- ☐ Steam Engineer
- ☐ Steam Electric Engineer
- ☐ Civil Engineer
- ☐ Surveying and Mapping
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- ☐ R. R. Locomotives
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Name ..... Age .....

Address .....

City ..... State .....

Occupation .....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 20)

finished or rough, or any group of blueprints can be had at cost. We do this so that boys who are in trade schools or technical high schools can do their own machine work. We are always glad to answer questions to the best of our ability and will help any junior builder in any project, regardless of whether he is using our stuff or not.

Respectfully,
FRED RATHEL.

Who was that who said he didn't believe in Santa Claus?

HERE'S some dope for California Light plane fans only.

You fellows have been writing to me with all your grief about California barring the flying of home-built airplanes, and I've been referring you to Alvia Peters of Monterey, California. Maybe you think I've been passing the buck, but now you'll have to admit I was at least passing it to the right bird. Mr. Peters has been turning the state upside down in his efforts to have the solons give us amateur flyers a break. Alvia is entitled to his gloat which appears below:

The Shop Mail Box
and
Everybody Else
Ladies & Gentlemen, etc:

(That last is probably for me)

If I owned Good Old Double M I would issue an extra and send out one to every ham in California. Why?

Well, just read Page 8, Section 1, of the new California aviation laws as revised from the 1929 laws. (Which says, in plain English, that a license is no longer required, just an identification number.)

Please tell the world and watch 10,000 hams get busy building their own in California.

Happy Landings,
ALVIA PETERS.

If you members of the California Chapter of the Hangar Gang want to get Alvia a loving cup in appreciation for his efforts, he may be reached at Box 331, Monterey, Calif.

HANGAR GANG NOTES

WARREN MUNDIS of 1222 Putnam Ave., Detroit, Mich., desires to get in touch with some light plane and glider fans living in Detroit.

MALCOLM OWENS of 68 Grand Ave., Portland, Ore., wants to know where he can

(Continued on page 24)

Eagles of the Air

VON HOFFMANN

TRAINED MEN ARE LEADERS

IN AVIATION

"When I Told Them I Graduated from VON HOFFMANN They Gave Me the Job"

So writes Richard McDougal, who is now an instructor in another Aviation School.

Mr. T. H. Worthington, another graduate, writes that he got a job as soon as he graduated. In a letter addressed to us shortly afterward, he said "Just as soon as I stated that I graduated from Von Hoffmann Air College, I noticed they took more interest in me."

Any number of letters come to us worded similarly. They all go to prove that Von Hoffmann graduates are readily accepted.

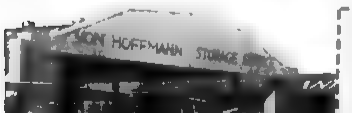
They are recognized throughout the industry. So thorough and complete is the training they get—so successful have been the men who preceded you, that air lines, commercial houses, other schools, aircraft and motor plants in all parts of the country give preference to men graduated by Von Hoffmann.

At the Von Hoffmann College, training for every branch of aviation is thorough and complete. It is one of the few schools in the country with the highest Government rating. That rating is a U. S. Dept. of Commerce approval for transport, limited Commercial and private—ground and flying. It was awarded only after the Government made a careful study of our equipment, instructors, and system of training. It is your guarantee of the best training. The training you get here exceeds the requirement of the Government. The perfect flying climate permits instruction every day in the year. So, if you would prepare yourself for a place in the aviation industry, get the best training that can be had. Send in the coupon below and we shall be pleased to send you full particulars without obligation, of course.

U. S. Dept. of Commerce approved school for transport, limited commercial, and private—ground and flying.

Located on the famous $2,000,000 Lambert-St. Louis Municipal Airport

VON HOFFMANN AIR COLLEGE
241 Lambert-St. Louis Municipal Airport, St. Louis, Mo.



VON HOFFMANN AIR COLLEGE
241 Lambert-St. Louis Municipal Airport
St. Louis, Mo. MAIL TODAY.

Name . . . . . .

Address . . . . . .

City . . . . . *State*

Age . . . . . *I am interested in*

( ) Flying Course ( ) Mechanics Course
( ) Welding Course ( ) Home Study

ANDY'S SHOP MAIL BOX

(Continued from page 22)

get plans for a sport-plane that he can build in a three-room apartment. A three-place plane, as it were.

JOE HLASNEY. You forgot to give your address when you wrote to Mr. Miller regarding Diesel engines. I have Jay Earle's reply tucked away in my Sunday overalls. If you'll send me your address I'll forward the letter to you.

THE SAVOGRAN COMPANY, India Wharf, Boston, Mass., is issuing a booklet named "How to Build Better Models". Some of the subjects covered are making the parts, assembling and furnishing the model, specific information on ship and coach models, and the making of toys and novelties. Copies may be obtained free of charge at most paint and hardware stores or by writing direct to the company.

HERE'S A REPLY to a fellow down in Texas who wrote to Jay Earle Miller, telling him that he was building a plane from Double M plans, and would teach himself to fly. Jay expresses my sentiments exactly.

"You say you want to teach yourself to fly. My advice would be to go to the nearest school and buy a couple of hours of time, at least. That will give you the primary training under proper supervision. People have taught themselves to fly—but it's a good deal like shooting yourself on the chance you'll miss all vital organs. If you do, you'll know what it feels like to be shot, but the averages are all against you."

REMEMBER when William B. Harty of Dedham, Mass., promised me an exclusive yarn on his invention which is to startle the whole civilized world, including the Island of Yap? Draw up an easy chair and let Mr. Harty go into the details.

My good friend Andy has asked me for a story concerning my flying submarine, and as we don't want to disappoint the darling for fear he may put molasses in our gas tank, I'll give you the story in the following paragraphs.

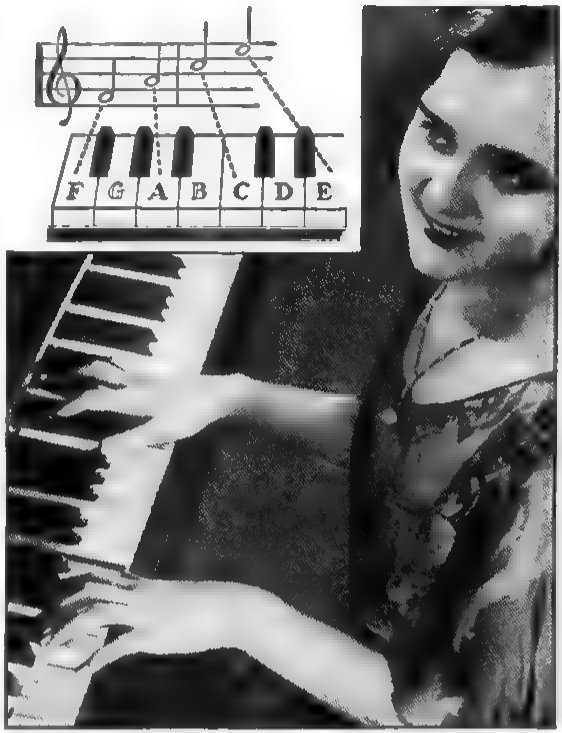
When work was first started it was necessary to find a fuselage that offered a very low parasite drag. For this a near perfect streamline was adopted. To this we added a keel to protect the hull when scraping bottom. Submerging tanks are fitted to the interior, and the hull is designed for a water pressure of 30 lbs. per square inch.

A Packard 2A-1,500 and a Dayton Bear

(Continued on page 26)

TWICE AS EASY

to become a popular musician this simple home-study way



DOES the very thought of harsh-sounding scales—compulsory practice and impatient teachers put a damper on your ambition to become a popular musician?

With such excuses as—"It takes too long"—"It costs too much"—"I don't know the first thing about music"—are you alibiing yourself right out of good times and a highly enjoyable attainment?

You're the Boss

You'd take up music in a minute, wouldn't you—if you thought there was a way of learning that made *every* lesson easy—that allowed you to study *when, where and as much or as little as you please*—that encouraged rapid progress—that did not cost too much?

All right. Such a method is far from being imaginary. It is *so real* that inside of a few short months you can learn to play your favorite instrument. Without taking lessons from a teacher! Without paying expensive fees! Without any tiresome technique to struggle through!

Thank the U. S. School of Music for the utter simplicity of this remarkable system. It removed completely the difficulty, boredom and extravagance from music lessons. Now to begin your musical career you don't even have to know "do" from "re" or a sharp from a flat.

Your own home is your studio. The lessons come to you by mail. They consist of complete printed instructions, diagrams . . . *and all the music you need without extra charge.*

A sheet of music is not a riddle to you. You never have to *guess* what's right or wrong—*you know!* First you are told how a thing is done. Then a picture shows you how, then you do it yourself and hear it. Small wonder it's *twice as easy* as old-fashioned private teacher method.

Play Your Favorites

Instead of just scales you are playing real tunes from actual notes—right from the very first lesson on. Sooner than you realize you will be bringing cheer to the folks at home with your playing. Gradually you gain confidence and professional expression. Then parties, popularity, orchestra work follow in short order. You'll know how good it feels to be out of the wall-flower class and into the whirl of things.

What Instrument for You?

Piano	Piccolo
Organ	Hawaiian Steel Guitar
Violin	Drums and Traps
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Flute	Sight Singing
Harp	Trombone
Cornet	Piano Accordion
'Cello	
Guitar	
Ukulele	
Saxophone	

Banjo, (Plectrum, 5-String or Tenor)
Voice and Speech Culture
Automatic Finger Control
Italian and German Accordion
Harmony and Composition
Juniors' Piano Course

Don't be afraid to begin your lessons at once. Over 600,000 people learned to play this modern way—and found it easy as A-B-C. Forget that old-fashioned idea that you need special "talent." Just read the list of instruments in the panel, decide which one you want to play, and the U. S. School will do the rest. And bear in mind no matter which instrument you choose, the cost in each case will average the same—just a few cents a day.

Free Book and Demonstration Lesson

Our wonderful Illustrated Free Book and Free Demonstration Lesson explain all about this remarkable method. They prove just how anyone can learn to play his favorite instrument in half the time and for just a fraction of what old slow methods cost.

If you really want to learn to play—if social popularity, and increased income appeal to you—take this opportunity to make your dreams come true. NOW! Sign the coupon and send it in before it's too late. Instruments supplied when needed, cash or credit. U. S. School of Music, 2625 Brunswick Bldg., New York City.

U. S. SCHOOL OF MUSIC,
2625 Brunswick Building, New York City

Please send me your free book, "Music Lessons in Your Own Home," with introduction by Dr. Frank Crane. Free Demonstration Lesson, and particulars of your easy payment plan. I am interested in the following course—

Have you instrument?

Name . . .

Address . . . . .

City . . . . . State . . . . .

These SIX BIG Money-Making Books

Yes, money—big money, can be made with the help of good books—the right kind of books, books which teach you how to do things better and to make money doing it. These 6 big books on

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are the greatest money makers that any man interested in automobile construction and repairs ever owned. Brimful of fascinating facts, designed to help anyone understand every detail of modern automobile construction. They become invaluable to you whether you own a garage, work for someone else, or are only interested in knowing how to keep your own car 100% efficient. These 6 big automobile books are published by the American Technical Society with over a million dollars of resources, enabling us to get the co-operation of the largest automobile manufacturing concerns who have supplied data sheets, specifications and the results of their own service experience. They are unquestionably the finest automobile books ever published and include over 120 pages on Aviation Motors.

New 1931 Edition

Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Nowhere else that we know of can you get as complete information. Over a million dollars of resources have enabled us to give you the best books on the subject ever published. You will find nearly 20 pages on front wheel drives alone. Every body interested in automobiles in any way will welcome these books, especially on our no money offer.

OVER **2500** PAGES
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Contains all the newest automotive developments, clearly and fully explained
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These books are sent to you without any obligation. You may keep them for full 10 days. Look them over, find out any facts you want to know, prove to your own satisfaction how valuable they can be. These books have been fully revised and meet every need of the automobile owner or expert.

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All we want you to do before we ship the complete set is to give us your name and address. Just send the coupon and we will ship immediately. On delivery you deposit only $2, plus the few cents delivery charges. Then keep the books for full 10 days before you decide whether or not you want them. You will immediately recognize the advantages of the Jiffy Index, which puts facts at your finger tips instantly. If you decide to keep them send $3 in 30 days and $3 a month until the special low price of only $24.80 is paid. There is no further money to pay and no other obligation of any kind.

Note: Of course, if you prefer you may remit $2 with the coupon and the books will be sent prepaid with the same guarantee and the same privilege of immediate refund.

American Technical Society, Dept. A-5320, Drexel Ave. at 58th St., Chicago.

You may send me the 6 big money-making books on automobile engineering (Auto edition), with the understanding that I will deposit $2 on delivery, which deposit is to be immediately returned to me if I return the books within 10 days, at your expense. If I decide to keep them, I will send you $3 in 30 days and then $3 a month until the special low price of only $24.80 is paid. Note: If you are enclosing $2.00 please check here. .

Name .....

Address .....

City ..... State .....

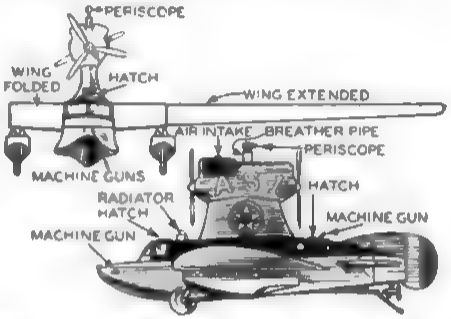
ANDY'S SHOP MAIL BOX

(Continued from page 24)

were selected for the power plants. These required a radiator, which was installed just forward of the front prop and is of the telescoping type. One radiator is used for both motors.

When the plane is submerged or running on the surface, the rear motor is connected to the water prop by means of a clutch. A tail skid protects the water prop and rudder when operating from land.

At the top of the power egg may be found a periscope, breather pipe, and an air intake for the front motor. The latter has a watertight cover which is closed before submerging. Air screws are also removed before going under. At present the breather pipe and periscope can be extended ten feet, and as we are using an internal combustion motor we can submerge to about 18 feet. Greater depths can be attained, but the craft cannot be driven, owing to lack of air.



Here are a couple of drawings showing the details of Harty II, William B. Harty's amphibian flying submarine. This is an improvement, or vice versa, over the flying U-boat, described in a former issue, the Danish Government developed.

In the forward cockpit we find the conventional airplane controls plus some three dozen other gadgets, including two machine guns which fire through the bow. The periscope controls are also here, and there are telephone connections to the pilot in the rear cabin.

We will explore the sacred sanctum of the rear as soon as we can wiggle out of this blooming man-hole and into the other. From this point the navigating, radioing, photographing, etc. are carried out—all by one man.

We expect a high speed of about 125 m. p. h. in the air, with a landing speed of 60 m. p. h.

As this ship will probably never be used for commercial purposes, the writer invites suggestions from the public as to what they would consider essential in a military plane of this type.

William B. Harty,
Box 22, Findlen P. O.
Dedham, Mass.

(Continued on page 28)

Pick Your Own Job!

I'll Help You to Get It

NO special experience required to get one of these attractive Government positions. All you need is to pass an examination—and it is easy if you prepare for it. And that's my business. For eight years I was a Secretary Examiner. Since then, during the past twenty years, I have helped thousands into well-paid Government positions, and I can help you get there too. I know *how to train you* to get highest rating in Civil Service Examinations, which will qualify you for first positions open. You get the job you're after within a year of passing examinations—or it *costs you nothing.*

Good Pay . . Short Hours Steady Work

RAILWAY POSTAL CLERK

$1850 to $2700 a year

Opportunity for travel. 15 days' vacation and 10 days' sick leave with full pay. Paid all the time.

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$1700 to $2100 a year
Special Clerks at $2200 to $2300

15 days' vacation and 10 days' sick leave every year with full pay. Promotions to positions paying up to $4,700 a year.

CITY MAIL CARRIER

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15 days' vacation and 10 days' sick leave every year with full pay. Good chance for rapid promotion to bigger pay.

R. F. D. MAIL CARRIER

$1800 to $2300 a year

15 days' vacation and 10 days' sick leave every year with full pay. A fine position for men in rural districts.

INTERNAL REVENUE and CUSTOMS HOUSE POSITIONS

$1100, $1680 to $3000 a year and up
Extra Pay for Overtime

POSTMASTER

$1200 to $2500 a year

This is a position of great importance. In small towns a position that can be made very profitable.

DEPARTMENTAL CLERK

$1440 to $1620 a year and up to $3000 a year
30 days' vacation and 30 days' sick leave with full pay. Work in Washington, or near home.

Get rid of the bugaboos of hard times, strikes, lay-offs, job-hunting that you must always worry about in ordinary jobs. Don't stick in the low-pay jobs that start you off in a rut and keep you there. Work for Uncle Sam in a fine position you can't lose for any religious, political or personal reasons. Here's a wonderful position you can easily get that pays you from $1850 to $3300 a year; where there are no strikes or lockouts, where you get vacations with pay, retirement pensions, 8-hour day, automatic yearly salary raises, unlimited opportunities for quick advancement and many other advantages you can't get anywhere else!

FREE

My New Book "How to Secure a Gov't Position"

If you are a citizen, eighteen to fifty, you can get the Civil Service Position you want. Write today for my new free book that tells all about the Civil Service—the jobs open, what you must do to get the job, the pay, the vacation, and all the big advantages of Government Positions. Find out just how I can help you land a steady good-paying position in the Civil Service in Washington, traveling, or near your home. Mail the coupon or a postal today.

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Rochester, New York

PATTERSON SCHOOL,
A. R. Patterson, Civil Service Expert,
435 Wisner Building,
Rochester, New York.

Please send me your big free book and tell me how I can secure a position with the U. S. Government paying me $1,850 to $3,300 a year, with excellent chance for rapid advancement. This doesn't cost me a penny.

Name .....

Address .....

City ..... State .....

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RADIO is a fascinating profession. Now you can become an expert in any one of its twenty different branches. Simply by studying in your spare time at home or at any of the four resident schools operated by RCA Institutes, Inc.

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Gentlemen: Please send me your FREE book which tells about your laboratory method of radio instruction at home

Name .....

Address .....

Occupation .....

ANDY'S SHOP MAIL BOX

(Continued from page 26)

How's this as a new use for an old Ford? Cecil D. McNeil, a professional diver of Seattle, Washington, made an inexpensive hand diving pump from a complete Ford block and a little labor.

Speaking of diving, cast your eyes on that snap immediately above. That's a new one on me, and I dare say on you. But let the man who made it tell you about it.

Seattle, Wash.

Dear Editor:

An old Ford block complete with head, pistons, rods and shaft, makes an inexpensive diving hand pump.

The pan and transmission are discarded and a suitable handle attached to the flywheel. The spark plug holes are fitted with 6-inch pipe nipples and all holes connected. It is necessary, however, that all these holes contain a check valve. Such a valve is also placed on the main line.

"Tees" are provided at the tops of the spark plug holes. These are fitted with nipples and drilled caps. The suction stroke makes this necessary, as the exhaust valves are sealed by replacing the spring pins and removing the cam lifts. The air hose is connected to the main line and the pump is ready to operate. This pump, I find, will deliver sufficient air to depths not exceeding forty feet.

There is little to buy and lots to discard from your old Ford. I priced hand pumps for rubber suit diving and found nothing under $75 for even a used pump, so I started in on "ye Olde Ford".

Yours sincerely,
CECIL D. McNEIL.

Well, with the undersea contributions of Harty and McNeil, we ought to be able to submerge before the hot weather hits us.

(Continued on page 36)

FREE

Get two wonderful books by mailing coupon below.

You get these Genuine High Quality, Imported Drawing Instruments, 14 Other Tools and a Drafting Table—all included in my Home Training Course.

These Two Books—
Mail Coupon!
Yes, Absolutely
FREE

2 Books FREE

Just Send the Coupon Below!

Jobs for Draftsmen in Great Industries—Learn At Home

Automobiles—Electricity—Motor Busses—Aviation—Building Construction.

There are jobs for Draftsmen in all of these industries and in hundreds of others.

Aviation is expanding to enormous proportions.

Electricity is getting bigger every day.

Motor Bus building is becoming a leading world industry.

Building of [illegible] buildings is going on all the time.

No structure can be erected without plans drawn by a draftsman. No machinery can be built without plans drawn by a draftsman.

I train you at home, in Drafting. Keep the job you have now while learning drafting.

I will train you in drafting right where you are in your spare time. I have trained men who are making from $3,600.00 to $[illegible] a year. There is a big future for draftsmen because you plan and supervise the work of others, or you go into business for yourself. Get started now toward a better position, paying a good straight salary, the year around. Comfortable surroundings. Inside work.

Earn As You Learn

I tell you how to start earning extra money a few weeks after beginning my training.

Employment Service

After training you I help you to get a job without charging you a cent for this service. Employers of Draftsmen come to me for men because they know that Dobe Trained Men make good as they have learned drafting by actually doing the work themselves, in a practical way. Employers know they are not taking chances on men trained by me.

Money-Back Agreement

I train you at home under a positive Money-Back Agreement. If my training does not satisfy you after you have finished, you get every penny back.

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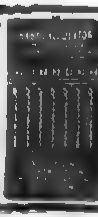

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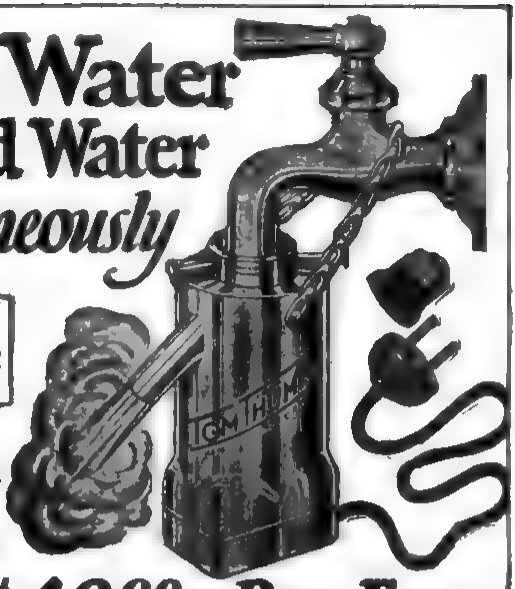

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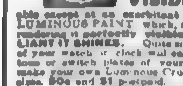

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Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

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GREATEST CURIOSITY! Smallest Bible in the World. Size of a postage stamp. Contains Old and New Testaments. Makes a good luck piece for the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, students, acquaintances, etc. PRICE 15c each, 2 for 25c, 12 for $1.25, 100 for $7.50. Also obtainable in Leather Binding, with gold edges. Price 50c each, 2 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible 10c.

STAR TOY MAKER

Greatest boys' book written. Tells how to make a Pinhole Camera, a Canoe, model Railroad, a Telephone, Boomerang, Telegraph Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Feed a Raft, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages, 150 illustrations. PRICE 10c.

AMATEUR ELECTRICIAN, all about electricity in simple language. How to make battery, dynamos, motors, telephones, bells, electric cells, engines, etc. etc. Price 10c postpaid.

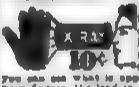
BOOK ON ROPE Ssplicing!

Useful knots, Hitches, Splices, etc. How different knots are made and what they are used for, knots that are useful, etc. Over 100 illustrations. All about wire rope attachments, fastening blocks, tackles etc. PRICE 20 CENTS.

STAGE MONEY

With a bunch of these bills it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 48 Bills 25c, 125 for 50c, or $3.50 thousand postpaid.

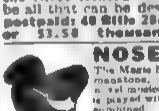
Wonderful X-Ray Tube



10¢

A wonderful little instrument that will disclose some startling and surprising illusions. Reveals the bones of your fingers, the lead in a lead pencil, the interior construction of coins, and many other similar illusions. Price 10c, 3 for 25c.

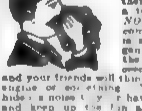
NOSE FLUTE



Post Paid 10c

The Marie Nose Flute, or Hormeastone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which when once acquired after a little practice will enable you to produce very sweet music that somewhat resembles a flute. Thereto use fingering and once you have mastered it you can play all kinds of music with facility and expression. When played as an accompaniment to a piano or any other musical instrument, the effect is so charming as to be entrancing.

NOSEBLOWER



When some men blow their noses it sounds like a trombone. Now the *NOSE BLOWER* has come to torment us. It is a starter! It is ingeniously concealed in the handkerchief. Proceed to blow your nose and your friends will think they heard a steam engine or something. You can blame the noise on your having a very bad cold and keep up the fun as long as you like. Full 8 10c 3 for 25c or 75c doz. postpaid.

Serpent's Eggs

Box contains 12 eggs. When hit with a match, each one gradually hatches itself into a snake several feet long which darts and twists about in a most life-like manner. Price per box, 10c postpaid 3 for 25c

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs

Well made and effective, modelled on latest types of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard 22 Cal. Blank Cartridge — obtainable everywhere. Send cash with order. Offer: 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our new $50 page De Luxe Catalog of latest novelties, all for ONLY $1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy Type) for pistol 50c. No C.O.D. shipments.

Special Offer 1 Blank Cartridge Pistol 100 Blank Cartridges 1 660 page Novelty Catalog ONLY $1.50

Text: Last Shipped by Express Only

LOOK 35¢ LOOK

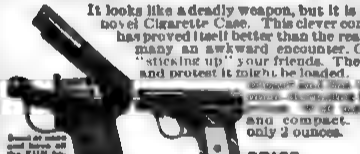
Wonderful instrument. Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngoscope — for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great — you need one. Don't miss it. Sent by mail. Only 35c or 3 for $1.00

Watch Charm Pistol $1.00

Exact reproduction of a neat pistol, actually firing REAL BLANK CARTRIDGES of smallest size. Illustration is actual size. It has hard steel barrel, with ring at end for attaching to watch chain. Loads like a regular pistol. Pull the trigger and it goes off with a loud bang. Pistol is break open type. Illustration shows position for loading. Made entirely of high grade steel, nickel plated, nicely handpolished and engraved handles, complete in box with cleaning rod. PRICE $1.00. BLANK CARTRIDGES, 25c per box of 25 (shipped by Express).

PISTOL CIGARETTE CASE

It looks like a deadly weapon, but it is merely a novel Cigarette Case. This clever contrivance has proved itself better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest it is loaded. Pull the trigger and [illegible] and compact. Weight only 2 ounces.



Small or large hands alike, the FUN is there every-body knows.

PRICE POSTPAID 25c

MICROPHONE TRANSMITTER BUTTON

$1.00 Postpaid

You can easily make a highly sensitive dictaphone by using the Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive apparatus. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can connect up different rooms of a hotel. This outfit makes a secret service operatives during the war. It is being used on the stage. It is ultra-sensitive and is the greatest invention in microphones. You can attach the button almost anywhere—card board boxes, stove pipes, pill calendars, on the wall behind a picture frame, etc. Button is so light and small it cannot be detected. Persons can be overheard without suspecting it. You can listen in on conversations in another room. A deaf person is helped when near the speaker. Connected to phonograph, piano or other musical instrument, music can be heard hundreds of feet away. Button may be used to renew telephone transmitters, often makes an old line "talk up" when nothing else will. The ideal microphone for radio use carries heavy current and is extremely sensitive. Amateur radio experimenters find the button useful for hundreds of experiments along the lines of telephones, amplifiers, loud speakers, etc. Many fascinating stunts may be devised, such as holding the button against the throat or chest to reproduce speech without sound waves. PRICE $1.00. JOHNSON SMITH & CO., Dept. 966, RACINE, WIS.

JOHNSON SMITH & CO.

Dept. 966 RACINE, WIS.

A De Luxe Edition of our new CATALOG mailed on receipt of 25c. Handsome binding. Bigger and better than ever. Only book of its kind. Nearly 900 pages of all the latest tricks in magic, the newest novelties, curios, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc. Numerous illustrations. Remit by Coin, Money Order, Check or unused U. S. Canadian and Foreign Stamps for all articles listed above. See next page also

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THROW YOUR VOICE

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

The Ventrilo

is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful DOUBLE THROAT, or VENTRILO, you can imitate many kinds of birds, animals, etc. Remember you get everything for ONLY TEN CENTS—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the Double Throat, or Ventrilo, and our big catalog of novelties, tricks, puzzles, masks, books, etc.

All Sent Postpaid to Any Address for only 10c

THE DANDY PERISCOPE

Very Interesting and Amusing Novelty

SEE WITHOUT BEING SEEN

Look Over the Heads of the Tallest Men in a Crowd.

See Over a Fence, Around Corners, Etc.

LOTS OF FUN AND AMUSEMENT

Strongly Made. Equipped with Mirrors, Sight-Finder and Eye-Piece.

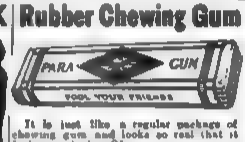
THIS is the same kind of instrument that the soldiers use in the trenches to watch the enemy without risk of being seen themselves, and every submarine has one to project above the surface of the sea to keep a look-out for other vessels, etc. With it you can see over a high wall or seat around a corner without being seen yourself, or if you are in a crowd, you can look right over the heads of the tallest men and watch all the fun. Our illustrations will give you some idea as to the numerous uses to which the Periscope can be put. Every Boy Scout should have one for spying and anyone else who wants some rare amusement. The Dandy Periscope is very strongly made, will stand the roughest handling and the hardest wear, and with ordinary use should last a lifetime. It measures 17 inches long, and a little over two inches wide. The Periscope Tube is handsomely decorated with colored designs to show many of its uses, and each Periscope comes complete in box.

Price Postpaid to any Address $1.00

INVISIBLE INK

The most confidential message can be written with this ink, for the writing carries no marks. Cannot be seen unless you know the secret. Invaluable for many reasons. Keep your pals and other persons guessing and wondering for hours. Only 15c a Bottle; 3 for 40c.

Rubber Chewing Gum



It is just like a regular package of chewing gum and looks so real that it fools everybody. Of course no one expects it is not genuine until they start to chew it. There's a world of fun in passing the rubber chewing gum—5 sticks in the package. Price, 10c Pkg.; 3 for 25c; 12 for 75c postpaid.

Rubber Tacks ..... Box 10c | Rubber Cigarettes. Price per Box, 20c
Rubber Cigars, Price Ea. 10c | Rubber Matches. Price per Pkg 10c

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment..... $1.00

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the greatest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon removing the lid has disappeared and is found in someone else's pocket), The HINDOO TRICK CARDS (can be made to change completely no less than five times), DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination), The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else), the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth), the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes), the WIZARD'S RING COIN TRICK, the ENCHANTED BOTTLE (no one but you self is able to make it lay down), the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid. JOHNSON SMITH & CO.**

U. S. BABY TANK

25 Cents

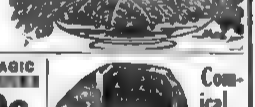
It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same life-like manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts, 2½ inches long. **Price only 25c prepaid. Stamps accepted.**

JOHNSON SMITH & CO.

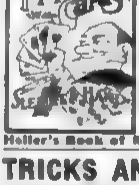
RESURRECTION PLANT

Great curiosity. Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes to sleep until put in water again.



PRICE 10c, 3 for 25c, 75c per dozen, postpaid

125 TRICKS WITH CARDS



Containing all the tricks and deceptions with cards ever invented, including the latest Tricks of the most celebrated Conjurers, Magicians and Prestidigitators popularly explained, simplified and adapted for home amusement and social entertainments. The whole so explained that any one can, with a little practice, perform the most difficult feat, to his own satisfaction and to the wonder and admiration of his friends. There is also added a Complete Exposure of all the Card Tricks made use of by Professional Card Players and Gamblers. Shows how "Skin" Gamblers cheat and you may by their informal "pointers," and other tricks. These features make it the best work ever published on Card Tricks.

PRICE 25c POSTPAID

Heller's Book of Magic ..... Price 25c Postpaid

An excellent little book containing 250 Parlor Tricks, tricks with dice, coins, and handkerchiefs, puzzles, rings, glasses, etc. So simple that a child can perform them. Profusely illustrated. Sent postpaid to any address for only 10c. 3 copies for 25c.

Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. **Price only 25c Postpaid.**

TRICKS AND SOCIAL ENTERTAINER

Cleverly performed feats of conjuring, sleight-of-hand and illusion interest everybody, and ability of the kind always makes one a welcome guest. This is a book of 96 pages, with nearly 100 illustrations. The instructions for performing are so plain and given that even a child with a little practice can do them as they only require SIMPLE APPARATUS. The book gives full and clear explanations of an unusually large number of clever tricks of all kinds, and a glance at the partial contents given below will give you a very good idea as to the comprehensive nature of this book. In addition there is a chapter on "SECOND SIGHT," a combination of five different methods which baffle the most astute investigators. The book is well worth the while even for those who merely wish to know how the tricks are done while for the amateur magician it is a perfect treasury of golden opportunities.

PRICE 25c POSTPAID

Magic for the Amateur Magician..... Price 25c Postpaid

The "Little Giant" Typewriter

A First Class Writing Machine For $1.50

A perfect little typewriter for $1.50. There are thousands of persons who would like to own a typewriter but whose means do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable the operator to write rapidly, the numerals 1 to 10, and the punctuation marks being other. With this machine you can send your best girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. With each typewriter we send a tube of ink and full printed instructions for using the machine. Price complete $1.50 by mail postpaid to any address in the world. Stamps accepted.

Send remittance (Postage Stamps accepted) to

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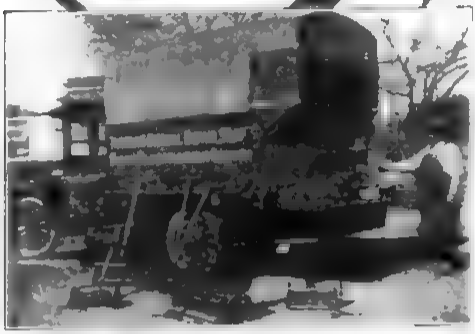
Do You Want a Fine Paying Cash Business Like This?



This Man Makes BIG MONEY!

"Six years ago I bought a Foley Electrakeen Lawn Mower Sharpener and mounted it on a small truck for a portable shop. First day I took in $13.00 in the afternoon. From then on as I became more accustomed to the work, I earned from $25 to $30 a day for the balance of the season. Since then I built and operated four trucks on a profit-sharing basis, and I can make at least $200 a month average net income from each truck as my share. The Foley turns out a perfect job and I have the same customers year after year."

H. N. WOODMANCY, Minnesota

FREE PLAN Starts You

A BIG OPPORTUNITY is waiting for wide-awake men who want to make BIG PROFITS and have an INDEPENDENT INCOME. Plenty of business everywhere. We tell you how to get started. No experience necessary—very little capital needed. Start at home in spare time, and build a steady, permanent business sharpening Lawn mowers by the Foley Electrakeen System—same system as used by leading lawn mower manufacturers.

BIG PROFITS for You

Get started NOW! 99c out of every dollar is CLEAR PROFIT! Mail coupon for complete information and FREE PLAN immediately.

Foley Manufacturing Co.,
1532 Foley Bldg., 11 Main St. N. E.,
Minneapolis, Minnesota.

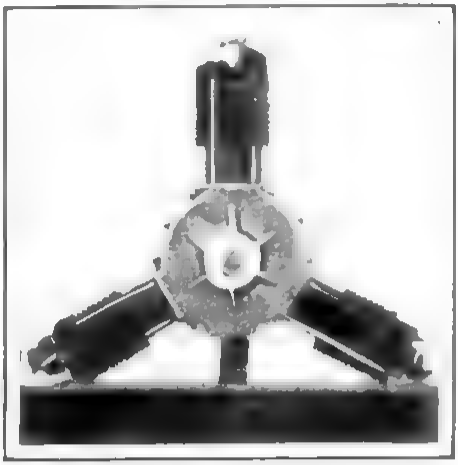
Send me FREE PLAN and complete information about the Foley Electrakeen Lawn Mower Sharpener.

Name

Address

ANDY'S SHOP MAIL BOX

(Continued from page 28)



Pete Gladchenko's aero engine, built from parts of 2 Headstrom motorcycle motors. Quite nifty!

CHEAP aero motors, built from parts of discarded motorcycle engines, seem to be the theme song of much of my mail. Granted that such a motor, giving real performance, would be a boon to light plane builders, we've never seen such a power plant placed on an airplane so that the crate could be made to go places and do things. The Henderson motor, converted a la Heath and Sensenich, are of course exceptions, for they have proven their worth. We are now on the trail of a fellow who designed a two-lunger from a Harley "74", and actually left the ground, but won't give you this dope until we are sure it is the real stuff.

Frequently we receive pictures and letters from readers who have designed and built a 3-cylinder engine from motorcycle parts, but the vital question—has the engine really powered a real airplane in flight?—is invariably lightly passed over as mere detail. To me it is a very important detail. We're glad to print pictures of the motors in this colyum, but if you want to make the inside of the mag just send us a real "How-to-Build" article on such a job, with conclusive proof that your engine will make a plane get up and step.

Following is a letter from a fellow who may be on the right track. I hope he is.

(Continued on page 38)

The WHITE WASP
AMAZING MODEL PLANE

Rises off Ground

WE'LL GIVE IT TO YOU

GIVEN AWAY!

Made by Kingsbury especially for us Obtainable nowhere else

Flight Guaranteed

Here's a high-flying, long-flying plane that's a positive sensation—the new White Wasp. Rises off ground. Will not nose-dive, stall or spin. Soars to high altitude in long, thrilling flights.

Made especially for us by Kingsbury, world's leading maker of model planes. Result of months of experimenting. Positively the slickest, snappiest plane you ever saw and will outperform most planes costing several times as much. Many brand new features which insure supreme performance.

Not a construction set—a ready-to-fly plane. 30 seconds after postman delivers your plane you can send it into the air, banking, zooming, rising over housetops. Look at these action photographs of White Wasp in flight!

We positively guarantee the White Wasp to fly and to satisfy you in every way. This plane will create a positive sensation everywhere. Every boy in town will envy you. Yet you may have it FREE!

A GRAND BOYS MAGAZINE

THE OPEN ROAD FOR BOYS MAGAZINE is a 50 page monthly magazine brimful of thrilling breath-taking stories of high adventure, aviation, deep mystery and suspense. Big departments. Contests galore with prizes for all. One whale of a magazine say 200,000 readers. Regular subscription price to OPEN ROAD FOR BOYS MAGAZINE alone is $1.00 a year. Fill out and send the coupon below, with $1.00 and we'll send you THE OPEN ROAD FOR BOYS MAGAZINE for one year and we'll rush a White Wasp Plane to you FREE of all charge. This is a great offer. Send coupon today.

USE SPECIAL COUPON

Pilot Edwards,
Open Road for Boys,
130 Newbury St., Boston, Mass.

This offer good only in the United States.

Friend Pilot: You bet I want this sensational plane! Here's my dollar. Put me down for a whole year for OPEN ROAD FOR BOYS MAGAZINE and rush me a White Wasp Plane immediately.

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This new booklet recently published, points the road that thousands have followed to increase quickly their earning power and popularity.

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$11.75

PNEUMATIC

Hamel Air Pistol [illegible] useful made. Ideal for target [illegible] small game [illegible] Rifled [illegible] accurate hard shooting [illegible] overall, wt. 2¼ lbs. Ammunition [illegible] Any one would be proud to own a Hamel. Guaranteed .177 and .22 Cal. 1500 lead pellets FREE!—$11.75 Pellets per 1000 .177 Cal. $1.50 .22 Cal., $2.50

Write for catalog—Guns, Rifles, etc.

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Amazing Offer on Brand New

books just off the press, which cover every phase of Modern Shop Practice. These seven big books contain over 2600 pages, nearly 3000 illustrations and are bound in special gold stamped flexible covers. Everything that any mechanic could possibly be interested in is explained in detail and in simple language that anyone can understand. Machine shop work, machine set-ups, machine repairs, mechanical drawing, metallurgy, forging, shop arithmetic, tool making, pattern making and hundreds and hundreds of other items, any one of which is worth the special price of these books.

Shipped FREE Anyone doing mechanical work of any kind can have these books shipped for examination **without one penny down.** If you want to fit yourself for a raise in pay, if you want to make yourself worth more money, if you want to be a tool maker, pattern maker, shop foreman or factory superintendent don't fail to look these books over. We mean just what we say, they will be sent to you **absolutely free.** Don't send us a penny, just your name and address. After you receive the books then decide whether or not you want to keep them. This is the best way to prove that these UP TO THE MINUTE books should be in every mechanic's hands and that they are worth at least ten times their price to you. **This is a brand new edition**

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American Technical Society, Dept. S-5320, Drexel Ave. at 58th St., Chicago, Ill.

Send for seven volumes Modern Shop Practice, FREE. If I decide to keep them I will send $2.00 in 10 days and then only $3.00 a month until the special low price of $29.80 is paid. Otherwise I will return the books and owe you nothing. By sending now I will get a free membership in the American Technical Society entitling me to full consultation privileges for one year by letter or wire with 18 experts.

Name .....

Address .....

Employed by .....

Address .....

ANDY'S SHOP MAIL BOX

(Continued from page 36)

1278 4th Ave., San Francisco, Calif.

Dear Andy:

Some time back the good mag M.M. did a write-up on building an aero engine from motorcycle engines. Mr. Howard Wagle of this city did it first, so I am claiming second place.

I used two Headstrom motors. These motors can be picked up dirt cheap all over the country. I made up the crank-case pattern myself, and had one cast with a small sump at the bottom. I have block-tested this motor for 32 hours wide open, and when torn down it showed no wear to speak of and needed no adjustments. It develops 30 horsepower and weighs 107 lbs. with a single mag.

Yours till next time,
PETE GLADCHENKO.

RECENTLY I have received several letters from embryo Count Zeppelins, asking how to build miniature blimps which could be parked in the garage beside last year's flivver. These letters have been referred to the editor of Plane Talk Department, and a reply to one of these letters is published here in the belief that others might be interested.

Wright Field, Dayton, Ohio.

Dear Sir:

The questions which you have asked would require quite a voluminous reply to explain in detail the various principles and details of construction which are involved. An attempt will be made, however, to give you the information in brief, and to refer you to such other publications and sources of information where additional information may be readily obtained.

The lift of hydrogen gas is approximately 68 lbs. per thousand cubic feet, and for helium 29 lbs. per thousand cubic feet.

The cost of hydrogen varies from $1.00 to $8.00 per thousand cubic feet, depending upon whether or not it is compressed into cylinders. The cost of helium varies from $16.00 to $24.00. For further information regarding hydrogen you may inquire of the Air Reduction or the Lindie Products Co., representatives of which no doubt are located in your city. Hydrogen is a by-product obtained in the manufacture of oxygen for welding purposes. The Helium Company is located at Logan and Gass Ave., Louisville, Ky.

The most suitable material for the construction of airship envelopes is rubberized cotton fabric. Numerous types of rubberized fabric have been developed to fulfill the requirements for the various items which make up the airship. The cost of rubberized fabric averages about $3.00 per square yard. For further details on airship and balloon fabrics you are referred to either the Goodyear Tire

(Continued on page 40)

Want a Steady Job?

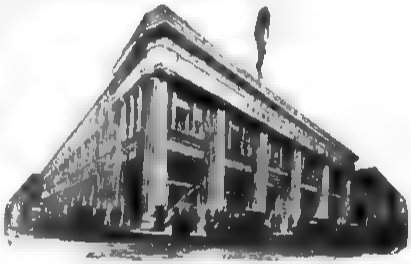
Railway Postal Clerks

$158 Month First Year
Raise to Maximum of $225 Month

Many Other U. S. Government Jobs Open to Men and Boys 18 to 45

POST OFFICE CLERKS RURAL MAIL CARRIERS CITY MAIL CARRIERS
PROHIBITION AGENTS CUSTOMS INSPECTORS

These are steady positions. Strikes, poor business conditions, lockouts or politics do not affect them. U. S. Government employees get their pay for full twelve months every year. There is no such thing as "HARD TIMES" in the U. S. Government Service.



ALLOWANCE FOR HOTEL EXPENSES

Railway Postal Clerks now get $1900 the first year regularly, being paid on the first and fifteenth of each month. $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year. $112.50 each pay day. They get extra allowance for hotel expenses when away from home

PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country.

CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers get $1700 the first year regularly and automatically increase $100 a year to $2100 with further special increase to $2300. They also have 15 days' vacation. City residence is unnecessary

What Will You Earn 5 Years From Now?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, kicking around from post to pillar, no chance in sight for PERMANENT employment, frequently out of a position and the year's average salary very low. DO YOU EARN $1900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2700 OR MORE A YEAR, EVERY YEAR?

Get FREE List of Positions

Fill out the coupon. Tear it off and mail it today—now, at once. DO IT NOW—This investment of two cents for a postage stamp may result in your getting a U. S. Government Job.

MAIL COUPON TODAY

FRANKLIN INSTITUTE
Dept. B-302
ROCHESTER, N. Y.

Rush to me entirely free of charge 32 page book with (1) a full description of the position checked below; (2) a list of U. S. Government jobs now obtainable; (3) tell me how to get the position checked

—Railway Postal Clerk	($1900-$2700)
—Post Office Clerk	($1700-$2300)
—City Mail Carrier	($1700-$2100)
—Rural Mail Carrier	($2100-$3400)
—General Clerk and File Clerk	($1260-$2500)
—Inspector of Customs	($2100 up)
—Prohibition Agent	($2300-$2800)
—Immigrant Inspector	($2100-$2900)

Name .....

Address .....

Use This Coupon Before You Mislay It—Write or Print Plainly

Here is Edwin McTeer (address on request) and some of his work. The crude pen drawing was made before he had any training and the striking story illustration (worth $100) was made after he took the Federal Home Study Course

He did it— Why don't you?

Edwin McTeer is only one of the hundreds of young men (and young women, too) who are succeeding in commercial art with the help of the practical training offered by the Federal Home Study Course. Well trained artists earn $50, $75, $100, $150 a week and more.

Success in Commercial Art

begins with a liking for drawing and the ambition to follow through with the right training. Mr. McTeer was thirty years old when he clipped a coupon like the one at the bottom of this ad, and took up the Federal Course. He progressed rapidly, increasing his earnings each year until, at the end of five years, he was making around $10,000 a year. Read what he wrote us

"I was not very talented when I entered this training with you people as you certainly know, and I had not even had high school training and I know any one with a love for work can accomplish even more than I if they will just let you people, the Federal Schools, help them

I suppose you remember I opened my own independent commercial art studio and to make a long story short, my earnings are now at the rate of over $10 000 00 a year."

Send for "Your Future"

If you like to draw—send for book "Your Future" and find out what amazing progress you can make with the right art training. Use the coupon now, giving age and occupation.

Federal School of Commercial Designing

2066 Federal Schools Bldg., Minneapolis, Minnesota.
Please send me your free book, "Your Future."

Name . . .

Age. . . . . Present Occupation . . .

Address

ANDY'S SHOP MAIL BOX

(Continued from page 38)

and Rubber Co., or the Goodrich Rubber Co., both of Akron, Ohio.

A rubber treatment for cloth has been found to be the most practical method of retaining gas in an airship or balloon envelope. Some use has been made of varnish and tong oil, applying them directly to the cotton cloth; however, this was used only for free balloons, which are inflated for one flight only. Rubberized fabric is the only material recommended for use in an airship envelope.

The amount or volume of gas contained in an envelope depends, of course, upon its shape. The method of calculating volume from a certain shape is covered in mechanical handbooks. An approximate idea of the volume of a streamline body, such as an airship body having a fineness of ratio of about 4 to 1, may be obtained by taking 60% of the volume of a cylinder in which the streamline form may be inscribed. Small, non-rigid airships require about one inch water pressure, as read on a water manometer. This pressure is at the lowest point of the envelope.

The length of time one filling of gas will last depends on the materials used and on the thoroughness of inspection of the envelope prior to inflation. As an estimate, it may be assumed that a replacement factor of 100% of the volume of the airship will be required throughout a year's operation.

No elements except an open flame or spark will cause hydrogen to burn or explode.

The purity of gas in a hydrogen inflated envelope is determined daily and not allowed to go below a purity of 80%. Pure hydrogen will not burn; however, it is obvious that a purity of 100% cannot be maintained and that the impurities will be air. Accordingly, as the purity of hydrogen decreases the possibility of combustion increases. At a purity of 68% hydrogen and air become explosive.

The volume of gas contained in an envelope increases 1% for each 375 feet of ascent up to 7,000 feet altitude. Above this it is approximately 1% for every 400 feet. Five degrees in temperature will change the volume about 1%.

It has been found that a useful load limit of a small envelope inflated with helium is about 40%.

External suspension rigging is the most efficient method of anchoring a car to the envelope of a non-rigid airship.

Ballast should be carried in the form of sand, water or fuel.

The questions which you have asked indicate clearly that a more comprehensive idea of the complications which are involved in even a small non-rigid airship should be obtained before indulging in any experimental or construction work. It is true that a small ship may possibly be constructed by a person not familiar with airship design, but such procedure is not recommended.

(Continued on page 42)

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By Major Victor W. Pagé. Aviation engines explained in simple questions and answers. Prepares you for job as aircraft engine mechanic; valuable to pilots and students. Describes all types aviation engines, parts and construction, principles of operation, with instructions for engine inspection, installation, trouble shooting, overhauling and repair. Compact, condensed, simplified. 400 pages, 250 illustrations. **Price, $3.00.**

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A brand new book on motorless flying. Explains everything about this popular sport; all types of Gliders and Sailplanes, construction, control and launching; principles of gliding, soaring, air currents, etc. Instructions for building simple Glider, with WORKING DRAWINGS. How to form a Glider Club, etc. 200 pages, 70 illustrations. **Price, Paper Binding, $1.50; Cloth, $2.00.**

☐ Modern Aircraft

By Major Victor W. Pagé. Covers all types of American and foreign airships, airplanes, and engines, design and construction, with complete instructions for operation and maintenance. Nineteen practical chapters. Used in 200 schools. 805 pages, 400 illustrations, 23 tables. **Price $5.00.**

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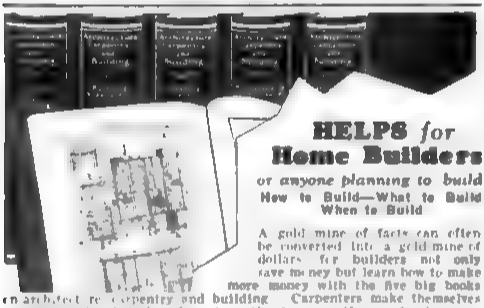

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A gold mine of facts can often be converted into a gold mine of dollars for builders not only save money but learn how to make more money with the five big books on architecture carpentry and building Carpenters make themselves contractors by learning how to estimate correctly; contractors are able to handle bigger and more profitable jobs by learning how the big fellows do it. Men who want to build homes can save money by learning how it should be done The new **Jiffy Index** puts before your eyes without waste time the things you want to know Nothing has been overlooked Thousands of details building construction heating lighting plumbing architectural drawing all fully covered We will include with the five volumes above, at the special reduced price of only $19.80 (easy payments) a handsome book, "Blueprint Reading" 120 pages, full of diagrams, etc., without extra charge

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I would like to look at the five books described above Send them on your free offer. I will examine them thoroughly and return them in ten days unless I like them, in which case I will send you $2 00 and after that $3 00 per month until the total price of only $19 80 is paid. You are also to send me Your book, "Blueprint Reading" without extra charge

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Employer's Name & Address .....

ANDY'S SHOP MAIL BOX

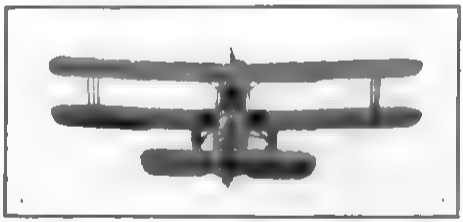
(Continued from page 40)

Considerable data are available in the form of publications by the Ronald Press, which if secured will give you an engineering conception of the problems involved in airship design. You may also write to the Department of Commerce for regulations covering the requirements for commercial non-rigid airships; also the Goodyear-Zeppelin Corporation at Akron, Ohio, who are equipped to build an airship of any capacity.

Yours very truly,

H. H. ARNOLD,
Army Air Corps.

Now that's what I call answering a letter. As far as I know, Double M is the only magazine in the world which gives such service as this to hundreds of readers each month. How about it, fans? Let's play fair with the eds. If to answer your letter properly is going to require the writing of a feature length article, for which publishers pay from 2c a word up, why not give an author a break and buy a book covering the subject. Take it from me, a person will have to read and digest more than one book before he is capable of designing and building an airship. If it were possible to cover such a subject in even an article of several instalments, the eds would give you a "How-to-Build" article in the mag.



900 hours went into making this six-foot model of Douglas mail plane by young Gerald Morey.

Speaking of models, which nobody was but somebody should have been, did you ever see anything quite as nifty as that six-footer shown above? It was built by Gerald Morey, who lives at 60 Wolcott St., West Medfor. Mass. Gerald is sixteen years of age, and spent nearly 1/32nd of that time working on this job, which you must admit is a good piece of work. The model is for sale, and Gerald suggests that it is good enough for a working model to be used in shooting a movie.

(Continued on page 44)

"Wishing" WON'T HELP YOU to FLY---

So stable that it can be flown with hands off the controls—the Heath Parasol, equipped with sturdy pontoons, leaves the water in 8 seconds. Pontoons, already built, with attaching gears, cost $265. Or complete material to build pontoons costs only $69—and comprehensive blue prints only $2.

but the Heath Parasol Will

This famous little plane is designed for beginners to fly. You can build it with ease—fly it with complete safety—and own it at small cost. Parts complete only $199. $12 starts you building!

Flying experience! Hard to get? Not a bit—when you own the famous Heath Parasol—America's most popular sport plane. Easy to operate, inherently safe, and economical to own—the Heath Parasol with its remarkably low landing speed is truly the ideal plane for beginners to fly. And it is the one plane you can easily build without technical training or experience.

Flown Like the Largest Planes

Consider that the Heath Parasol is flown exactly like the largest planes. That it offers big plane safety and performance with the added convenience that its smaller construction affords! That it requires no airport—as it lands on any field or even a highway. And that it requires no hangar. For with wings mounted on the sides—it can be parked like a car in any city garage or country barn!

What It Will Do

Just picture the pleasure this great little plane offers you! Just imagine flying all the hours you want over a 400 mile cruising radius. Attaining an 85 mile per hour top speed. Climbing to a height of 18,000 feet. Yet so inherently safe that it lands at the remarkably low speed of 28 miles per hour—and stops within 60 feet of landing!

Unequalled Low Flying Cost

Consider also the unparalleled economy features of the Heath Parasol. You can buy it complete for $97.50. Or you can build it from the very clearest most detailed plans for only $199. Parts may be purchased in 11 convenient progressive groups. $12 brings the first shipment. And the complete flying cost, including gas, oil, storage, etc., is actually less than 1 cent a mile!

QUICK FACTS

1. A center wing plane as well as a Parasol type can be built from the standard Heath construction set by a simple adjustment of the wings.
2. 85 miles per hour top speed
3. 400 mile cruising radius
4. 28 miles per hour—the remarkably safe landing speed
5. 40 miles per gallon of gas
6. 300 lb. safe carrying load
7. Winner for 5 consecutive years of first place in light plane events at the National Air Races

No Technical Training Needed

22 years of constant improvements make Heath plans clear and remarkably easy to follow. Technical training is entirely unnecessary as detailed instruction sheets cover every operation. You too can build your Parasol in quick time and like hundreds of others, you'll find it a real aviation course in itself! Don't delay another day. Let us tell you more about this great little plane. 10 cents in stamps or coin brings our large illustrated booklet. Mail the coupon below today.

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Ready to Flyaway $975.00

HEATH AIRCRAFT CORP. CHICAGO

Heath Aircraft Corp., Dept. M331, 1721-9 Sedgwick St., Chicago, Ill.

Enclosed find 10 cents for postage. Without obligation—please send me your large illustrated booklet. I am particularly interested in

☐ The complete Parasol—ready to fly away at $975.00

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Name

Address

City State

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increases income

600% in three years

When we first came in contact with Albert L. Russell of Victoria, B. C., Canada, he was a sales clerk in a radio store—and his salary was just as ordinary as his job.

Within three months of his enrollment in LaSalle Modern Salesmanship training, he was offered an outside radio sales position with an increase of 100 percent. He accepted and six months later a larger house, attracted by his sales record, hired him and his earnings went up another 100 percent.

Today he finds his earning capacity has increased 600 percent.

Do you wonder that he writes, "If there is anyone anywhere who doubts the possibilities of LaSalle training, refer him to me"?

Send for free book
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For the man not now a salesman who would like to enter this highly profitable field—*for the man, also, who is now selling and would like to greatly increase his volume*—LaSalle has prepared a 64-page book entitled "The Modern Salesman, Ambassador of Progress."

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You have often thought that you would send for one of these books. This time—for the sake of a brighter future—ACT!

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Please tell me about your *salary-increasing plan* as applied to my advancement in the business field checked below. Send also copy of "Ten Years' Promotion in One," all without obligation.

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Present Position .....

Address .....

ANDY'S SHOP MAIL BOX

(Continued from page 42)

Ray F. Kuns, our Motor Mechanics Editor, in a lighter moment proves to be a sportsman de luxe.

WHAT do you think of my idea in starting a "Let's Get Acquainted" department? Editors, you know, are a modest lot, and are loath to pose for their portraits. However, we tricked Ray Kuns, for we told him we were taking a picture of the fish and needed a man standing near to show the comparative size. Darn clever, these grease monkeys! Here's what Ray has to say concerning the episode:

> **"I have just returned from a ten day trip to Florida. Here is the evidence. Of course, I have had much difficulty in getting anyone to believe the story I tell about this sail fish, however, I maintain that this is my fish and was not merely borrowed for the occasion. If you will look carefully you will see that this sail fish is without a bill on his upper jaw—the only one of its kind taken in Florida waters to date."**

We believe you, Ray—darned if we don't. Pictures don't lie!

(Continued on page 46)

Real Woodworking Efficiency with *Delta* Motor-Driven Tools

They Save Time and Labor—Produce Better Work

There is a new thrill in woodworking these days. Motor-driven tools have taken out all the drudgery, all the tiresome "elbow grease" from working with wood—and left only the sheer pleasure of making things quickly, easily and **beautifully.** Motor-driven band saws and circular saws have supplemented the hand saw . . . motor-driven jointers are replacing the hand plane . . . motor-driven borers and routers are eliminating hand drills and chisels For this is a modern age . . . and the modern way is the motor-driven way!

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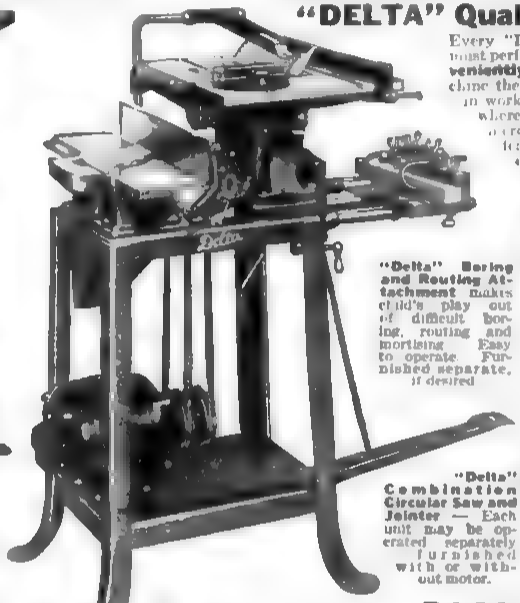
Every "Delta" woodworking machine must perform its work **efficiently, conveniently and quickly.** In each machine there is practical design, quality in workmanship and materials (even where it cannot be seen), and numerous exclusive constructional features That's why woodworkers everywhere say that the "Delta" gives most machine value for the dollar



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Address . . . . . Age . .

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"One day the superintendent came back in our department. 'Jones,' he said to me, 'we need more trained men in this place—like you!' When you took that course with the International Correspondence Schools you did a great thing for yourself—and the company. I wish some of the others had. We wouldn't be laying them off now. There is always a place for trained men here'."

"When I took my I. C. S. course," says H. M. Reeves, of Ironton, Ohio, "I was working 10 hours a day in the factory, with three hours overtime at night three days a week. I studied in what spare time was left." You can turn your spare time into training and money too! Today is the time to start. Mark and mail the coupon!

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☐ Spanish ☐ French	☐ Illustrating ☐ Cartooning
☐ Salesmanship ☐ Advertising	☐ Lumber Dealer

Name..... Age .....

Address .....

City ..... State .....

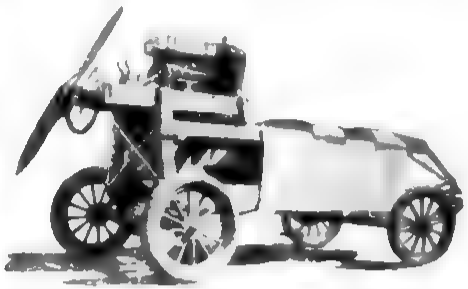
Occupation .....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 44)

Just so that we get a little bit of everything in this month's cramped quarters, I'll give you a peep at a letter I got from one of my Canadian fans. But first pipe the picture.



A wind-wagon constructed by the Froebe Brothers, of Homewood, Manitoba. This highly original vehicle makes thirty-five miles per on the road.

Maybe you won't be able to tell what this contraption is at first glance—but here's the letter explaining all about it:

Dear Inkslingengreasemonkey:

We've been shrinken up pretty tight with all your dope and ink, but your new resolution is a reinforcer. We think your little corner should be half the book, not exaggerating according to your dope. (Hope the editor reads this.)

We have been one of M. M.'s valuable subscribers ever since the Heath Parasol was published. We all think Double M is the mag made to order for light plane builders. You may think it intruding of us to introduce ourselves as the Froebe Brothers: Nick 19, Doug 18, and Ted 16. (Not at all boys, I'm glad to meetcha.)

Airplanes have always been our study and main thought. We built a Heath Anzani Parasol last spring, securing practically all of our instructions from Double M, to whom we owe our thanks.

We are also sending a shot (see above) of a windwagon of our own design, which we built about three years ago. It was a three place pusher, having a back seat driver. (You just can't get away from them, can you?) The power take was rather flimsy and caused sufficient vibration to shake the coils out and make her miss and lose revs. We never finished the cowling, as she was too heavy to produce enough speed. It had a prop of our own make, and with two passengers would chase down the highway at approximately 35 per.

Very truly,

FROEBE BROTHERS,
by Doug. Homewood, Manitoba, Can.

LET ME PROVE IN 7 DAYS

that I can make YOU a NEW MAN!

CHARLES ATLAS

Holder of the title of "The World's Most Perfectly Developed Man"

By CHARLES ATLAS
Holder of the title
"The World's Most Perfectly Developed Man"

ALL I want is *one week* to prove that I can give you a powerful body of might and muscle like mine—with my quick *Dynamic-Tension* method.

Here's all you do:

Just jot down your name and address on the coupon below, mail it to me—and I'll send you, absolutely free, a copy of my new book, "*Everlasting Health and Strength.*" It reveals the secrets that turned me from a 97 pound, flat-chested weakling into a husky fellow who won the title of "The World's Most Perfectly Developed Man" against all comers! And it shows how I can build *you* into an "Atlas Champion" the same easy way.

It tells the fascinating story of how I've taken undeveloped, flabby, no-muscle men of all ages and given them big powerful muscles, increased measurements all over, amazing strength, endurance, vitality and pep—all in a few minutes of spare time daily at home.

Thousands of fellows all over the world have used my methods—and now *you can too.* Like them, you can put on firm layers of muscle where you need it most, tone up your whole system, banish constipation, poor digestion, bad breath, pimples and other ailments that rob you of the good things and good times of life, and get the "drive" that'll take you to the top of the ladder.

Easy My Way

I haven't any use for apparatus; I don't dose you or doctor you. *Dynamic Tension* is all I need. It's the *natural*, tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of ailments and surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

Accept My FREE BOOK

Why be only 50% of the man you can be? Send NOW for a free copy of my new large illustrated book loaded with pictures of myself and others who have used my secret methods. Read what I did for *them.* And find out what I can do for *YOU.* Don't put off becoming the husky, big-muscled NEW MAN you can be! Mail the coupon TODAY.

Address me personally, CHARLES ATLAS (Dept. 6E) 133 East 23rd Street, New York City.

FREE BOOK

My large illustrated book, "Everlasting Health and Strength" has shown 20,000 others the way to big muscles and strong, healthy bodies. Send for your copy NOW.

CHARLES ATLAS, (Dept. 6E)
133 East 23rd Street, New York City.

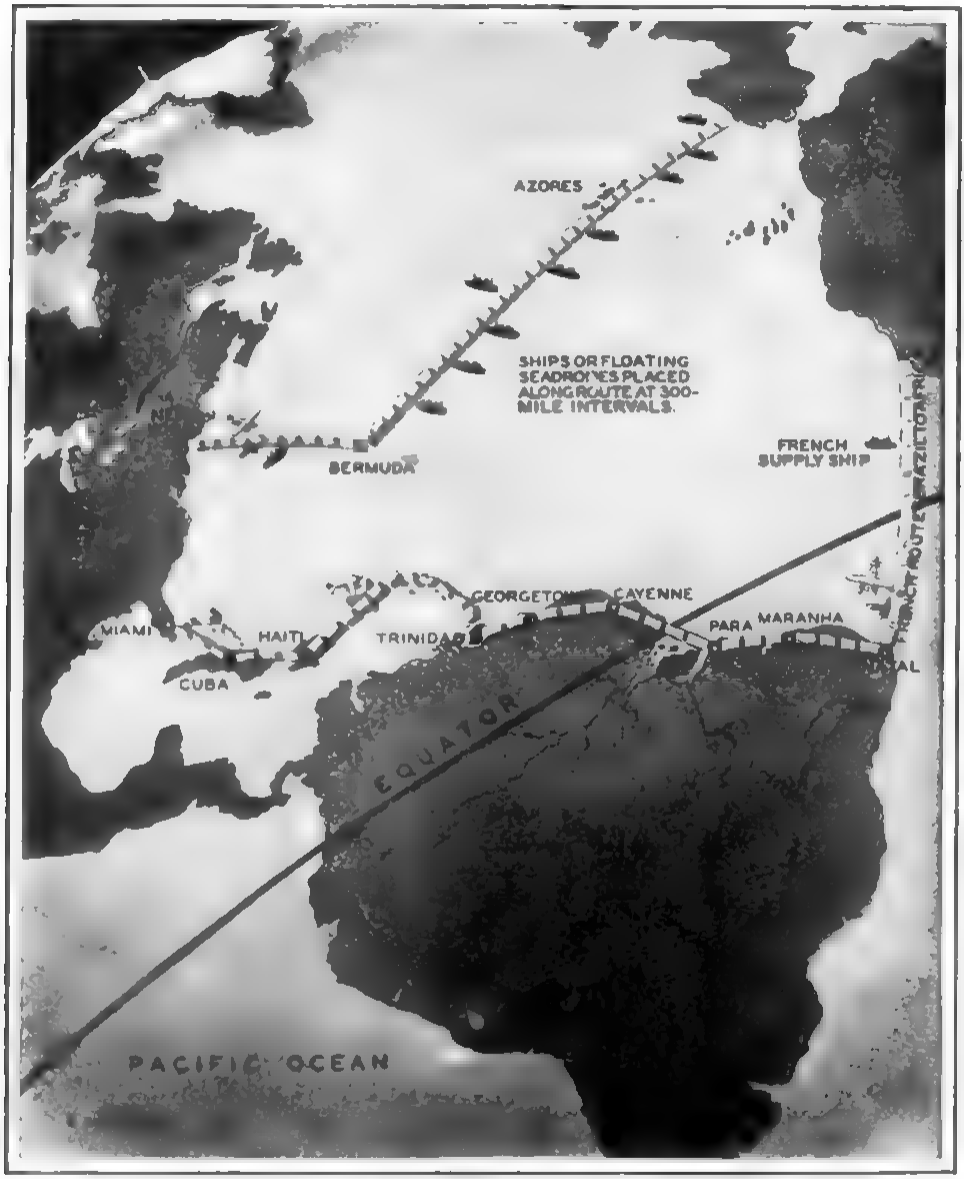
I want the proof that your system of *Dynamic Tension* will give me, too, a healthy, husky body and big muscle development. Send me your free book "*Everlasting Health and Strength*."

Name .....
(Please print or write plainly)

Address .....

City ..... State .....

Bridge of BOATS to Guide



Two trans-Atlantic air mail routes are shown in red on this map. The route from New York to Lisbon is the one for which the government has requested bids from air mail operators. Vessels of wartime construction, now lying idle, would be stationed at intervals of 300 miles along the route, to guide airplanes by radio beacons and to serve as rescue ships in case of forced landings. Huge floating seadromes on which planes could land may be used instead of ships. The Pan-American airways now carry mail from Miami to Brazil. From Brazil to Africa a French company carries mail by steamer and plane.

Trans-Atlantic Air Mail

by **BEVERLY BARNES**

Within a few weeks you'll be able to drop a letter in your local mail box and have it delivered in Europe in a few hours, carried by airplane all the way. How this trans-Atlantic air mail will be guided by a bridge of boats or seadromes is explained in this timely article.

THE "bridge of boats" which America rushed to completion thirteen years ago to carry an American army to France and help win the war, may become a bridge again to guide the first trans-oceanic air mail line across the North Atlantic.

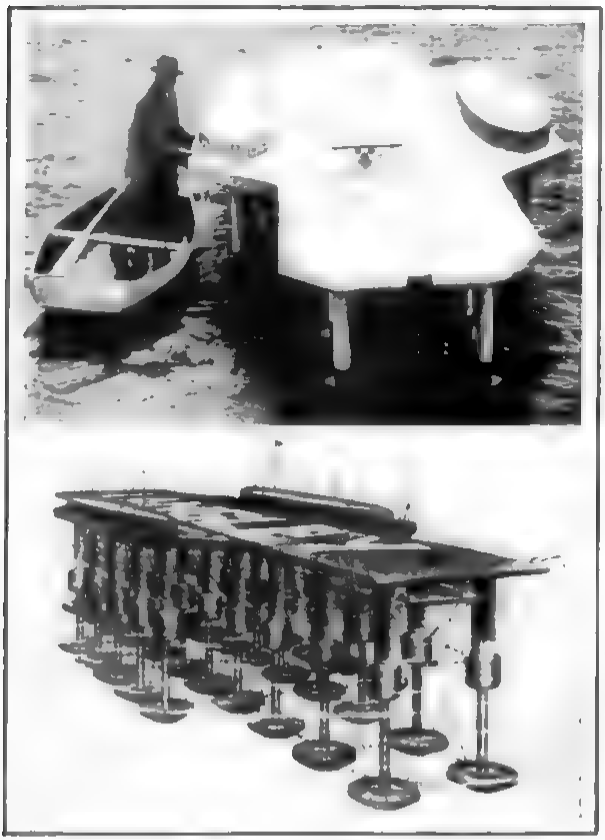
While this is being written, in early March, the postoffice department at Washington is busy preparing an advertisement soliciting bids for a trans-Atlantic air mail service. By the time these words appear in print the invitation will have been issued, and it is possible that the first mail flights may be made before the end of the year.

Irving Glover, second assistant postmaster general, in charge of all air mail activities, is sponsor for the suggestion that some of the old war-time vessels, laid up by the shipping board years ago, be refitted and anchored at intervals across the Atlantic to form service stations, radio beacons and mile posts for the air mail line. Ten ships anchored at intervals would be sufficient to safeguard the route from New York to Bermuda and Bermuda to Lisbon, Portugal, by way of Fayal, in the Azores. The use of the old ships as radio and light ships and spare parts and fuel stations would be only a temporary expedient until the "floating islands" designed by Edward R. Armstrong can be built and placed along the route, as his company plans to do.

Glover's suggestion of using the war-time

Wartime shipping board vessels may be fitted out to serve as mother ships on the projected trans-Atlantic air mail route. Hundreds of government ships are now tied up useless at navy yards.

Floating Landing Fields May Mark Route



Floating landing fields may be used on the trans-Atlantic route. Top photo shows Edward R. Armstrong with a model of his sea-drome; lower photo shows how underwater parts keep it floating.

ships depends on who the successful bidder is, for the method of hopping off across the ocean will be left to the winning bidder.

If carried out, however, a single ship anchored midway between New York and Bermuda would divide the first leg of the ocean hop into sections of slightly less than 400 miles each. From the ship constant radio bearings could be sent day and night, assisted by a beacon light at night.

Seven ships anchored between Bermuda and the Azores would be sufficient to divide the longest leg of the flight into 300 mile sections. With ships at those intervals the planes would never be more than 150 miles from a radio direction beacon, and a fuel and repair station, while in event of a forced landing between ships the nearest vessel could drop its moorings and proceed to the rescue.

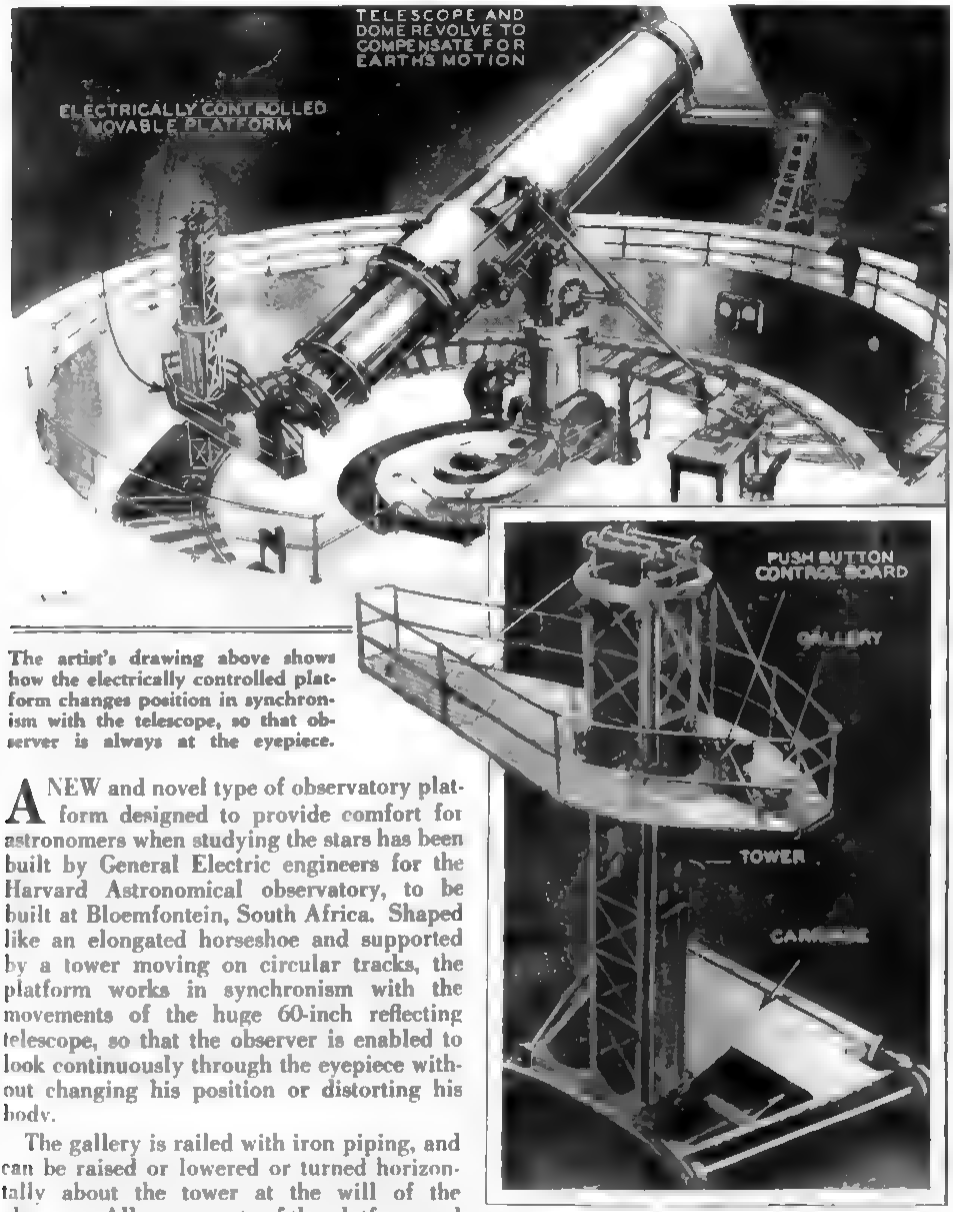
Two, or possibly three ships, would be needed between the Azores and Lisbon. From the Portuguese city a land route via Bordeaux and Havre would connect with London, or a shorter land and sea route could be laid out up the Portuguese coast, across the Bay of Biscay to Brest, and from there to Southampton, England.

The French Compagnie Generale Aeropostale already is operating an air mail line from Europe to South America, although fast steamers have been used for the comparatively short hop from Dakar, West Africa, to Natal, Brazil, by way of St. Paul Rocks and Fernando Noranho, the famous Brazilian penal island off the coast of South America. The steamers are shortly to be replaced by seaplanes, and, in fact, several experimental trips have been made by plane.

At Natal, the French line connects with the east coast lines of the Pan-American Airways, the American mail and passenger lines which reach from Miami, Florida to Buenos Aires, by way of Cuba, Porto Rico, the Leeward and Windward Islands, and Trinidad, Georgetown, Cayenne, Para, Maranhao and Natal. The ocean hop from Dakar to Natal on the French route is not much greater than the famous flight of the U. S. Navy's "NC" boats from the tip of Newfoundland to the Azores, just after the war.

Regardless of whether or not Glover's suggestion to use the war-time ships as floating islands is adopted, it is practically certain the successful bidder for the first north Atlantic air line will use either flying boats or amphibians with boat hulls, and not land planes. The experience of the Pan-American air lines, operating, with its subsidiaries, a total of 19,190 miles of air mail and passenger routes, has shown that multi-motored amphibians, such as the Sikorski, are sufficient for the fairly short hops between the islands of the West Indies and across the Caribbean.

Self-Adjusting Platform for Star Gazing



The artist's drawing above shows how the electrically controlled platform changes position in synchronism with the telescope, so that observer is always at the eyepiece.

A NEW and novel type of observatory platform designed to provide comfort for astronomers when studying the stars has been built by General Electric engineers for the Harvard Astronomical observatory, to be built at Bloemfontein, South Africa. Shaped like an elongated horseshoe and supported by a tower moving on circular tracks, the platform works in synchronism with the movements of the huge 60-inch reflecting telescope, so that the observer is enabled to look continuously through the eyepiece without changing his position or distorting his body.

The gallery is railed with iron piping, and can be raised or lowered or turned horizontally about the tower at the will of the observer. All movements of the platform and dome are made by electric motors operated by remote control through pushbuttons on a portable switchboard. The platform stands fourteen feet high and weighs, altogether, three and one-quarter tons.

The gallery on which the observer stands moves up and down on the tower which, in turn, circles about the observatory on tracks to hold observer in position. All movements of the platform and dome can be controlled with the pushbuttons on the gallery switchboard, as shown in above photo.

Smashing Down Skyscrapers

Every day, wreckers in New York and other big cities crash down millions of dollars worth of skyscrapers which are still sound in construction and capable of many years of service. Why this seeming waste? Factors which pronounce death sentences on buildings are set forth in this article.

The 50-story Irving Trust building, New York, rose on the site of four skyscrapers demolished at a cost of $250,000. The white line outlines the position occupied by the former buildings shown at right before being razed.

IF a census were taken of the skyscrapers of America you might well be astonished to find that the stanchest and sturdiest of structures is ready for the graveyard after twenty years. No matter how modern and formidable a skyscraper may be on the day its portals are thrown open, it will get whiskers with the passing of two decades and be ready to lie down and die, and another edifice, bigger and more solid, will rise over its debris.

This decay of skyscrapers has given rise to a race of skyscraper smashers whose daily toil is concerned with battering down tall buildings. The wrecking job which cleared the path for the new Irving Trust Company building at No. 1 Wall Street is a good example of the magnitude of the tasks which confront the skyscraper destroyer. The contract for this job was awarded to the wrecking corporation of which Albert A. Volk is president.

The mention of "contract" hints that the skyscraper-annihilators have a highly-organ-

ized business, founded on a firm basis wherever it is carried on by big operators. It is by no means a fly-by-night adventure.

When three buildings were bought by the Irving Trust Company to be replaced by a 50-story structure, the contract for its construction was awarded to Marc Eidlitz & Son. The latter sent out notices to a list of building-wrecking firms, which they knew by previous experience or reputations, for bids.

Albert A. Volk proved the lowest bidder. One wrecking contractor would not do the job for less than $500,000. To be removed were the 16-story Chimney Building, the 24-story building at 74 Broadway, and the Central Union Trust building which was erected back in 1889, of fort-like solidity. Volk offered to clear away these bulwarks for slightly over $250,000.

"If we will examine minutely the various details which figured in this job, we will get some notion not only concerning the stupendous industry which building-wrecking has grown to be," declared Mr. Volk, "but also we will get at the inside of the business angles which determine success or failure.

When wreckers get on the job, things start crashing. No attempt is made to salvage marble, only steel being saved.

"In connection with the Irving Trust Company project let me say first that the wrecking business is a highly speculative one. It is far different from that of the building contractor who is able to calculate beforehand, rather accurately, just how much the job is going to cost and approximately the profit he stands to make.

"Although I intend to concentrate on the No. 1 Wall Street work, I shall draw from other experiences to clarify points involved in this business of tearing down so that others may build up. A building-wrecker cannot possibly determine from an inspection of a prospective structure just what encumbrances he will face when his men commence destroying it.

"Concrete buildings are particularly deceiving. It is essential that we know the kind of mortar which has been used in the masonry. More money has been lost by the wrecking contractor through his failure to gauge the hardness of the cement mortar than through any other miscalculation.

"The contractors who tore down the old Madison Square Garden almost cast their own resources into the debris because they had misjudged the size of the job. The steel frame-work which was preserved still is languishing in storage in anticipation of the day when it will be set up again in another city. However, the move has been considered doubtful economy lately, and the material may eventually wind up at the mills for resmelting.

"In that Central Union Trust Building we found walls ranging in thickness from eight to ten feet. You can readily understand what that waste of space would mean in the Wall Street district. No doubt that building was envisioned in the same light as the Egyptian Pyramids, constructed for posterity, if not eternity.

"On the other hand, what the original

Twenty Years Is Average Life of Skyscraper Before Going to Wreckers

Within twenty years, according to the experience of wreckers, these New York skyscrapers will have been torn down to make room for newer buildings. Reasons for this short life are mainly economic ones.

builders were not able to foresee was that the very tenor of business in this environment would undergo many changes in the course of time. They did not dream at what a premium space would be at the corner of Wall Street and Broadway. Such a building had outlived its economic life.

"I do not hesitate to admit that a $250,000 contract for wrecking buildings for a site is a rather handsome one. Before the World war, I remember, wreckers would willingly pay for the privilege of salvaging a building. In those days I might have actually cleared over $100,000 on a job similar to that of the Irving Trust Company.

"The reason for this reverse in the financial status of the wrecking business is explained by the increased cost of labor. It has multiplied ten-fold. Barmen, men who use bars, are paid $1.35 an hour, and time and a half for overtime. It is strictly understood beforehand that they are going to have overtime. Should a contractor fail them in this regard, they will immediately desert him for one who will give them that concession.

"My method in drawing up my bid for the Irving Trust Company contract is typical of the usual procedure I follow. After a personal and thorough examination of the buildings to be demolished, I take into account the season of the year. Then I make my observations on the shape of the structure and its location as regards traffic. Tearing down skyscrapers becomes more difficult and hazardous in congested business districts.

"Then I take into consideration my implements at hand. Not only the seasoned workers available but also the efficiency of the machinery which can be utilized. In recent years the use of machinery, such as compressors, rock drills and derricks, has cut in half the time required for wrecking a building.

"Fortunately, I have twenty-six years of experience in this business behind me. Otherwise I am quite positive that I would be at a loss to compile figures which would represent a sane bid on any job. That is why this is one industry which necessarily must draw its leaders from its own ranks. Not only is the boss's eye required constantly on the job, but he is the only one who can estimate costs. For an outsider it would mean ruination, and I have been witness to some disastrous episodes in that direction.

Buildings can sometimes be moved instead of wrecked. This business block in Kenosha, Wis., was moved 50 feet backward and 8 feet sidewise, its weight rolling on steel rails visible in foreground.

"Another clause which has entered into the wrecking contractor's agreement is the bonus and penalty. It is stipulated at the outset that the wrecker will receive so much for each day that he completes the job in advance of the date agreed upon and he will be fined so much per day for every day he goes beyond the agreed date.

"We did the Irving Trust Company job in 62 days, which was five days shorter than the contract called for. Our agreement called for a $3,000 a day bonus, which netted us $15,000."

Mr. Volk's army of wreckers took down nineteen 6-story buildings in seventeen days to make room for the Chrysler Building in New York City. This brought the Volk Company a bonus of $25,000.

"It is this swift clearing of sites which today has brought the value of salvaging materials down to a negligible point. As I said previously, in other days I could have cleared $100,000 from the salvaged materials alone in that Irving Trust Company project, apart from expenses. However, the total derived from the rescued materials amounted to $40,000.

Use of chutes to lower scrap materials to waiting trucks on the street below is well illustrated in this photo of a Fifth Avenue mansion being razed.

"The $40,000 represents principally the steel which was taken from the buildings. Steel alone has any value for us today. Everything else is considered waste and use-

Building Weighing 11,000 Tons Moved by 18 Workmen With Jacks

This nine-story office building of the Indiana Bell Telephone Co., at Indianapolis, is one of the largest ever moved. Weighing 22,000,000 pounds, it was turned at right angles to its original position, as shown, without disturbing workers inside. It was moved 15 inches an hour by 18 giant jacks, over rails laid on a concrete bed. The cost of moving this huge structure was about $300,000.

less. The salvaged steel is scrapped and sent to the mills to be resmelted. There is a good market for this scrap metal. It is very much desired by steel manufacturers because it adds to the caliber of steel which is manufactured.

"The market for this steel by-product of the wrecking business resembles the regular steel market in many respects. That is, it fluctuates with the price of regular steel. This year we have received $8 and $9 a ton for it. In the past it has been as high as $17.

"There is quite a market also for granite. This is much in demand by stone-cutters and monument dealers who buy granite for graveyard markers. When we made room for the Standard Oil Building at 26 Broadway, we found a stone weighing nineteen tons at a height of 250 feet. I could never understand why any man ever wanted a stone like that way up there. That stone went to a number of graves.

"But in general we are only concerned with speed. The demand for it prohibits the salvaging of materials, therefore it is a big economic factor in not only the high cost of wrecking but also in the rise of construction costs in the big cities where sites are desired in definite localities.

"Since a building in a big city today becomes obsolete after twenty years, the sponsors of major building investments have to include in the calculations of operating expenses and yield the approximate cost of tearing the building down again after two decades.

"However, to revert to the matter of speed in demolition, the building contractor wants his site cleared as soon as possible. It may mean that a small fortune is wasted in keeping a site unoccupied and unproductive, even for a very brief space of time. It is for this reason that we have summoned every possible instrument of the machine age to our aid.

"When the building-wrecker of the metrop-

(Continued on page 190)

"Mirror Writing" Doubles Brain Capacity

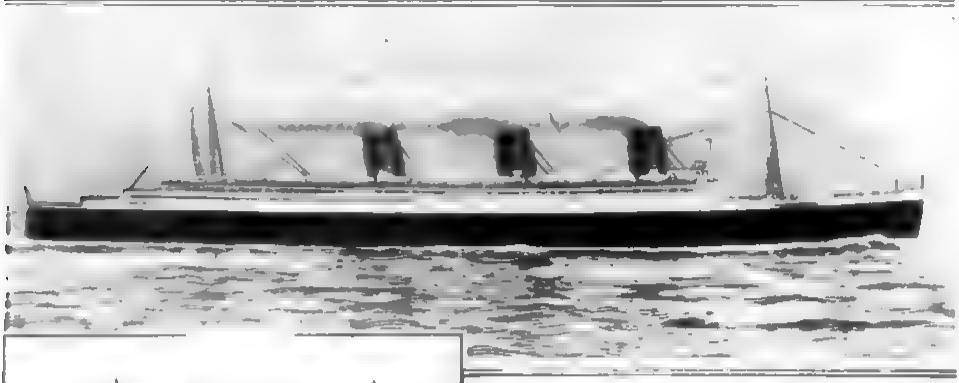
Jack Borlase, shown above, increased his working day to 20 hours, without fatigue or ill effects, by dividing his day into two halves, in the first of which he worked normally, and in the second read and wrote backwards, or mirror-wise, as illustrated. Normally right-handed, he writes with his left hand during his second working day, which ends at three o'clock in the morning. Specimens of his mirror writing are reproduced at the left; hold them in front of a mirror if you can't read them.

DOING ten hours' work in the usual right-handed way, Jack Borlase, of Salt Lake City, Utah, has succeeded in adding another ten hours to his working day by the simple process of turning left-handed, writing backwards before a mirror and reading in the same fashion. This system, he maintains, exercises both halves of the brain, which organ, as is well known, is composed of two hemispheres, a right and a left.

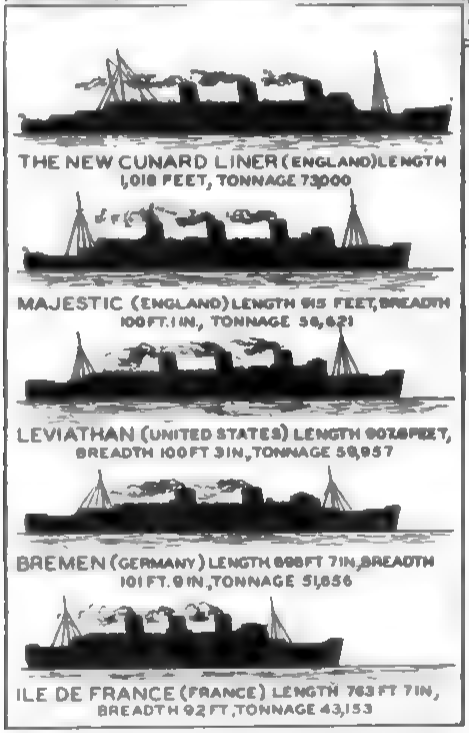
Mr. Borlase recommends that readers of MODERN MECHANICS AND INVENTIONS interested in extending their working day to 20 hours, give his novel system of obtaining a "balanced brain" a trial. All that is necessary, after a normal day's work is done, is to start right in again, doing all your office writing, reading, and mathematical calculations backward in front of a mirror. Your handwriting will look something like the specimens reproduced above, written by Mr. Borlase. After a little practice, you'll be able to read and produce this type of writing rapidly. If you normally write with your right hand, do the mirror writing with the left, and vice versa if you're naturally a "southpaw."

In testing out his theories, Mr. Borlase did a normal day's work, and at five o'clock, the usual quitting time, started to work again, reading books from their mirrored reflections and writing mirror-wise with his left hand. He worked thus until four o'clock in the morning, when sleepiness overtook him. On arising from bed at half-past six, after perhaps three hours' sleep, he would be perfectly rested, ready to go to work again with the right-handed half of his personality, which had enjoyed a complete rest during the hours of the night when his left-handed self was working.

Britain to Build Largest Liner for Atlantic Speed Honors



Artist's drawing above shows the mammoth 73,000 ton Cunard liner as she will look when completed.



This drawing shows the size of the new Cunard liner in comparison with other mammoth liners which will compete with her for trans-Atlantic trade. She is expected to break the record in north Atlantic crossings set by German liner "Europa."

ENGLAND'S latest bid for the commercial supremacy of the seas is represented in the construction, which is to begin at once, of a new gigantic liner that will take the honor of being the largest and fastest in the world, excelling even the huge *Europa* of Germany. The building of the mammoth ship will require three and one-half years, and give work to 3000 men, who will construct her in the world's biggest drydock, located at Southampton.

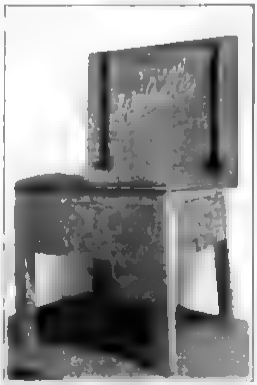
Costing between $22,500,000 and $25,000,000, the new liner will have a speed of 30 knots, a tonnage of 73,000, and a length of 1,018 feet. The accompanying sketch shows her in comparison with her competitors.

Develops Metal Film for Camera

A METAL camera film that has the lightness, flexibility and efficiency of common celluloid film has been invented by a noted French scientist, M. Louis Lumiere. The metal of the film is produced under a recently developed process which is being kept a secret by the inventor.

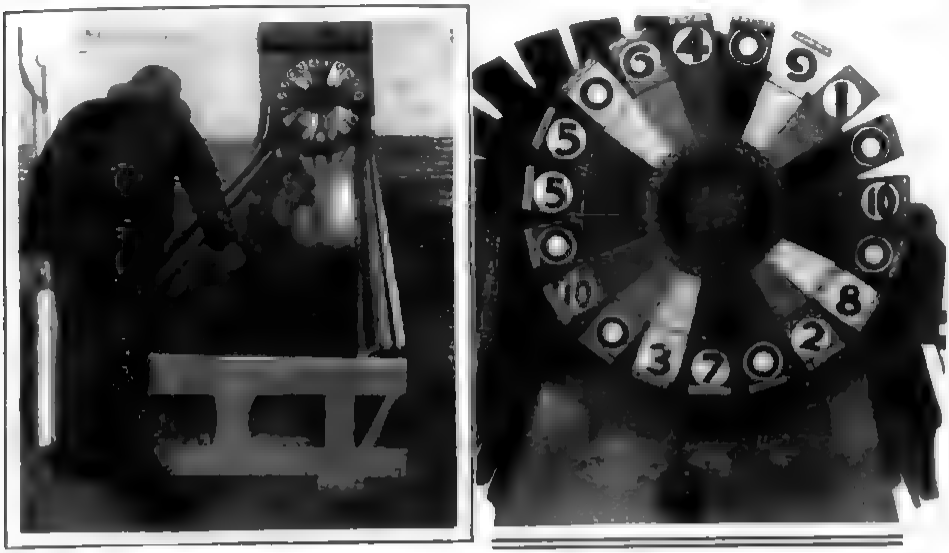
Sport Chair Has Collapsible Back

SPORT fans who find football stadium seats intolerably uncomfortable will welcome a new chair recently invented which has a hinged back that automatically drops to a position covering the seat when the chair is not in use. Equipped with a waterproof cushion, the chair is extremely durable.



Designed for use at stadiums, this chair has sturdy back that folds down on seat.

Modern Mania for Mergers Now Menaces Minor Sports



This new electrical bowling game requires the player to judge the speed of his ball and of the rotating wheel. The player must hit the two tens and one of the combination tens to produce a box score.

RAILROADS, banks, and other big business organizations have no monopoly on the merger idea. Inventors, bereft of original ideas, are now turning their attention to combining separate ideas into one complete whole merging, as it were, the well-known ideas of the past.

Nowhere, perhaps, has this tendency been so pronounced as in the world of minor sports. Polo long ago merged with swimming in a game known as water polo, tennis and fly-swatting emerged as ping-pong, dominoes and rummy met in China and returned as mah jong, while labyrinth puzzles and golf united in the popular craze of putt-putt.

On this page are illustrated a couple of new ones. Above we see where bowling and roulette have gotten together under the modern urge, while at the right is revealed a combination of miniature golf and billiards.

The new bowling game is played on a regulation alley which curls up at the end, where an electrical wheel is located. The wheel has nineteen spokes, the ends of which are hinged and bear a painted number. The entire wheel revolves at a regulated speed, and the player attempts to gauge the time so that his ball will hit the desired number when it reaches the bottom.

Bilgo is the name given to the combination of golf and billiards, while golf and pool are known as Poogo. Both games are played on a six by twelve table inside a wooden frame.

Any of the various billiard and pool games may be played on the table shown in photo above, using a putter instead of a cue.

Unsolved Mysteries

Fire accounts for the mysterious disappearance of many ships. Fortunately, the British steamer, "Ayrshire," shown here, was able to get help with the aid of wireless before she sank in the Indian Ocean.

What were the mysterious fates of the innumerable stout ships that literally vanished from the earth when they disappeared over the horizon upon their departure from their last port of call? Mr. Harris has searched the annals of marine history for plausible explanations and sets them forth in this fascinating article.

OF ALL the baffling mysteries which abound in the world, perhaps the most bewildering are to be found in the annals of marine history. What, for instance, became of the huge passenger liner *Waratah* which disappeared twenty-one years ago with three hundred people on board, never to be heard of again? What, too, happened to the gigantic 19,360 ton Navy collier *Cyclops*, which seemingly vanished from the face of the earth, leaving not an atom of wreckage behind for identification? Then, what became of the crew of the American brig, *Mary Celeste*, which was found completely abandoned in mid-ocean, with a half-eaten meal on the captain's table, but no sign of violence anywhere? While all sorts of explanations of these grim mysteries have been advanced, yet no one knows for certain, for there have been no survivors to give first hand information.

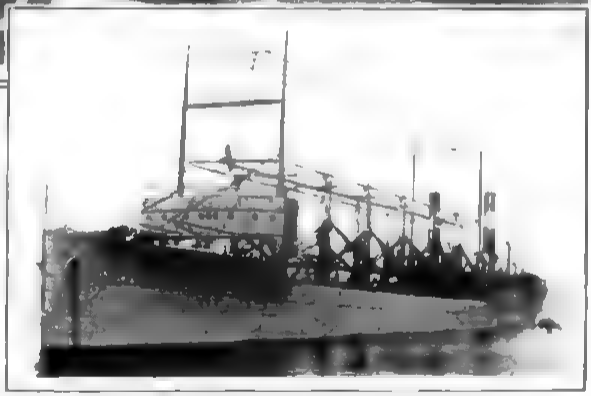
Some time ago, after a two-day search through newspaper morgues and the public library, I located, buried in an inside page of a fast crumbling old newspaper, a single paragraph that told of the probable fate of the *Waratah*.

There was wireless in use at sea back then in 1909—in fact it was just shortly before the *Waratah* sailed from Sydney, Australia, on its last voyage, that Jack Binns electrified the world by sending out the S. O. S. that saved all but six of the passengers and crew of the sinking White Star liner *Re-*

of the SEA

by WILLIAM J. HARRIS

A probable solution of the mystery of the "Cyclops" is illustrated above. With ends heavily loaded, strain on the empty midships section may have caused the hull to break apart in heavy seas, snapping off the wireless so that aid could not be called.



The United States Navy collier "Cyclops," 19,360 ton vessel with crew of 309 men, which mysteriously disappeared in the Atlantic ocean during the World War, leaving no trace.

public in the north-Atlantic.

But when the ill-fated *Waratah* put to sea, bound for London, via Port Natal, no laws had been passed making wireless equipment mandatory, and, outside the crack liners of the Western Ocean, its adoption had been slow. The *Waratah* left Port Natal on July 26 and simply disappeared, as so many fine ships have done, and never a trace to explain her loss has come to light, unless it is contained in the single paragraph in a paper of September 21, 1909. That single paragraph, under a Manila date line, read:

"The British steamer *Harlow*, Captain Bruce, from Newport News June 14 for Port Natal and Manila, reports that on July 27, while 180 miles out from Durban, South Africa, she passed a steamer afire. The vessel in question, whose name it was impossible to make out, was shortly afterward destroyed by an explosion. It is supposed that this vessel was the missing British steamer *Waratah*, which, with 300 persons aboard, has not been heard from since July 26."

There's nothing there to explain why Captain Bruce did not obtain more information, what the weather conditions may have been, or anything that would explain the event. A

Sea Traditions Demand Captain Stick to His Sinking Ship to the End

Left—One of the most extraordinary pictures of a ship disaster ever taken. Frenzied passengers aboard the ill-fated "Vestris" are attempting to launch life boats from the sinking vessel. Right—Carl Schmidt, of Chicago, "Vestris" passenger, being rescued by "S. S. Berlin" after 17 hours in water.

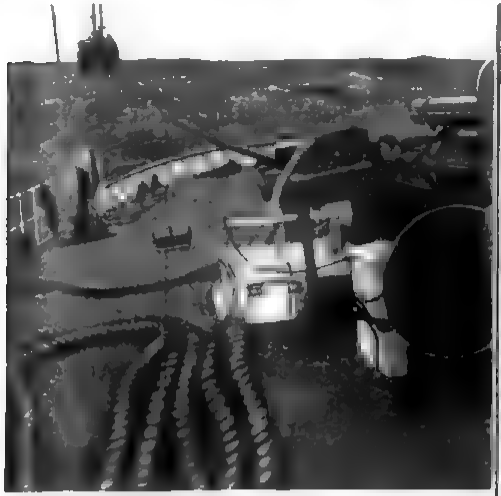
search of other records shows that a storm was raging over that section of the sea at about that time.

Only six large ships, presumably wireless equipped, are listed in marine records as disappearing without a trace since the perfection of wireless. But that ships, even wireless equipped, can so disappear is proven by the case of the greatest tragedy of them all, the loss of the U. S. Navy collier *Cyclops* in March, 1918, during the World war. That a great steel ship of 19,360 tons, well built and manned by a crew of 309 well trained officers and men, could go down on a comparatively short voyage and leave not so much as a piece of life boat wreckage, a scrap of wooden deck fittings, or a floating life jacket to tell the tale seems almost past belief. Yet that is just what happened to the *Cyclops*, and, while naval experts are fairly sure today what caused her to disappear, the mystery of the lack of all evidence of the wreck is just as intriguing as it was back in June of that war year when she went down.

The *Cyclops* had been diverted from her usual duties of carrying coal to the warships of the fleet to bring manganese ore from South America to fill the urgent need of steel mills working on war contracts. The manganese ore, for a given bulk, was far heavier than coal, and so a full cargo of it occupied much less space than the cargoes for which the *Cyclops* was designed. On the fatal trip the ore had been loaded mainly in the end holds, leaving all the midships section of the ship practically empty. Northbound, the *Cyclops* put in at the Barbadoes for fuel, leaving there on March 4, 1918. Sometime within the next forty-eight hours she is presumed to have broken in two amidships, the break snapping the wireless aerials, while the two halves went to the bottom so quickly that there was no time to remove lashings and launch the lifeboats.

When the *Cyclops* failed to arrive or report by wireless the navy began a search that continued for weeks. It was suspected she might have been captured by a German raider, and for weeks the navy withheld reports, hoping the lost ship might be located or be heard from. Through neutral sources, inquiries were even made in Germany, without result, and finally, in June, the navy reluctantly announced the *Cyclops* had disappeared and presumably had gone to the bottom.

Several years later the erratic performance of a sister ship gave a definite clew to what might have happened. Naval experts decided



A disabled vessel being towed into port by a coast guard ship, one of the fleet which plies the seas ever watchful to rescue stricken ships.

Above—First to receive the SOS call from the ill-fated "Vestris," which sank recently off Virginia coast, was Arthur Jensen, chief radio operator of the "S. S. American Shipper." Below—Rescuers launching a boat from "S. S. President Roosevelt" to save the crew of British freighter "Antinoe. Two of these men were lost in their heroic battle with the seas.

that under the loading arrangement the ship was subject to excessive "hogging" and "sagging". When a ship is poised on a wave crest the ends have a tendency to droop and the center, supported by the wave, to rise. That is "hogging". When the opposite condition prevails, and the ends are on two waves and the center in the trough, the ship sags.

But the *Cyclops* design apparently did not make sufficient allowance for the strains, and, when that naturally weak condition was aggravated by loading all the cargo in the fore and aft compartments, leaving the center virtually empty, a break was apparently the result.

The queen of all mystery tales of the sea, however, is the story of the American brig, *Mary Celeste*. Captain Griggs commanding, a 500-ton ship bound from New York to Genoa. In mid-Atlantic a Nova Scotian barque bound from New York for Gibraltar sighted the *Mary Celeste* sailing over a calm sea in a rather erratic fashion. Glasses failed to show any one in sight on deck, so the Nova Scotian skipper put a boat party aboard to investigate. In the cabin they found remains of a half eaten meal, but there was no sign of a single person aboard. The last entry in the *Mary Celeste*'s log had been made eleven days before. The brig was towed to Gibraltar and an investigation made there. Two deep cuts were found in the brig's bow, as though an attempt had been made to fake collision evidence, and a rail had been hacked with an axe. A sword showed evidence of having

Top photo—The five-masted German barque, "Adolf Vinnen," sunk in shallow water near Cornwall, England. Bottom—Wreckage of schooner "Brooklyn" washed ashore near Eureka, Cal.

been wiped clean of blood before being returned to its scabbard. The *Mary Celeste's* life boat was in its place, but the sextent, manifest and bill of lading were missing, though the cargo was intact. From that day, sixty years ago, down to the present no one has ever solved the mystery, or heard of Capt. Griggs, his wife, child, or crew.

Yet disappearances are just as possible in this age of wireless. Only a few years ago the Japanese steamship *Tenzam Maru*, disappeared in the south Atlantic without sending out an S. O. S., and leaving no clew.

Norway had a mystery in 1926 when the walrus fishing steamer *Istievnan* was found abandoned on the coast of Finmark, northern Norway, with the table set and the lights burning. Several months later a German sailor, dying in the Hammerfest hospital, confessed he was one of a band of liquor smugglers who had boarded the ship, killed the crew, looted their effects, and then set the table and lit the lights as a blind to cover the crime.

Years earlier the British steamer *Brankame Hall* had met the four master barque *Butishire* in mid-Atlantic, with distress signals flying, and the running lights still burning. Apparently the crew had left the ship in a storm the previous night, believing she was about to sink.

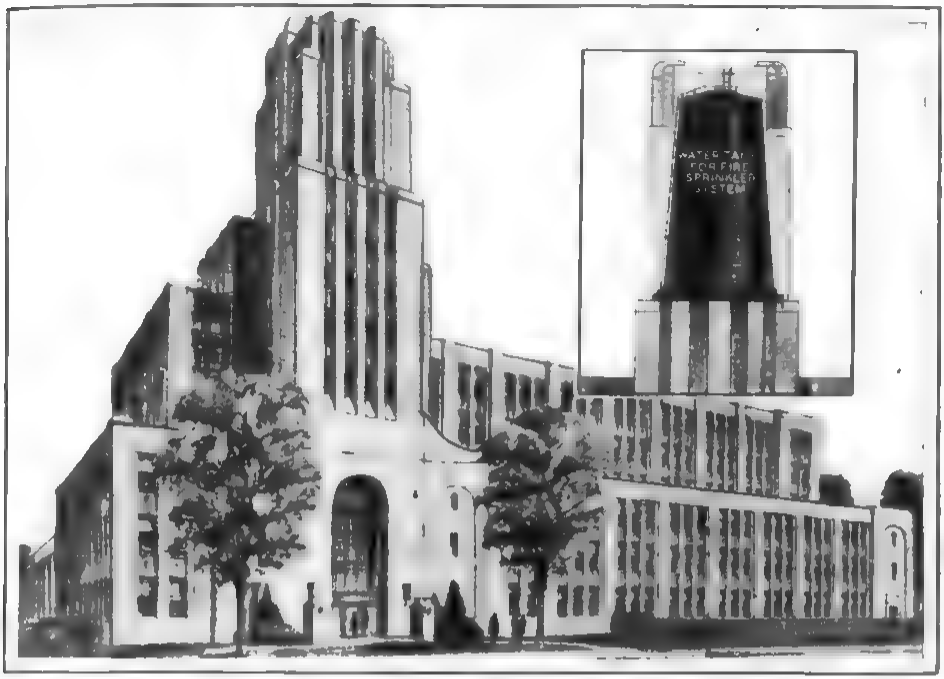
The British ship *Marathon* met the American ship *James B. Chester* in the Atlantic, and, on boarding the 1,000-ton vessel, found no one aboard, though she had been abandoned so recently that the brass work was still bright. In each of these cases no trace of the crew was ever found.

The record for greatest loss of life in a ship which simply vanished is still held by the *City of Glasgow*, one of the first iron steamers, a little 1,650-ton barque rigged ship with a 350 horse power steam engine. She also was the first steamer to carry steerage passengers, and the first ship to have a drug store aboard. In March of 1854, she put to sea with 450 people aboard, and was never heard of again. The fifties were bad years for ships, for in May, 1853, the *Ship Aurora*, out of New York, vanished with a crew of 25. In 1856 the Collins liner *Pacific* vanished with 288. And in 1857 the Anchor liner *Tempest* disappeared with 150 aboard. Those losses were never equaled until the *Waratah* and the *Cyclops* vanished with 300 and 309 souls, respectively.

In recent years there have been other mysterious disappearances, usually attributed to storms. One of the latest was the Danish training ship *Kjobenham*, which disappeared in the South Atlantic in 1929 with 60 cadets aboard. British Board of Trade records show from eight to twelve British ships of all sizes vanish on the average each

(Continued on page 194)

Built-in Water Tank Enhances Beauty of New Warehouse



The architect's perspective drawing of the new supply warehouse and workshop being erected at Watertown, Mass. The inset shows how the fire sprinkler water tank has been installed in an attractive tower.

ONLY too often we have seen an otherwise beautiful building marred by an unsightly water tank, standing, like a tar barrel on stilts, atop the roof. A large New England telephone and electric company, by placing the tank for the fire sprinkler system in an attractive tower, has effectively concealed this necessary but usually unsightly accessory.

Another feature of the building is that the numerous skylights are of actinic glass, thus excluding the sun's heat and glare but affording the utmost of light to the company's 600 employees.

Combination Sleeping Tent and Collapsible Boat Can Be Carried on Back

A RECENT invention of a German sportsman is a new camping outfit which combines a sleeping tent and collapsible row boat in one compact take-down outfit which may easily be carried on the back.

The boat, which is made of light but strong rubberized fabric, is inflated with a foot bellows as shown at the right. It may then be used for paddling over lake and stream or as a comfortable bed, the inflated bottom of the boat providing an excellent mattress. Two light wood frames, a telescoping ridgepole, and a light waterproof pup-tent complete the portable camping outfit.

The collapsible boat is here being inflated with the foot bellows for use as a comfortable camp bed and pup tent.

"Merry-Go-Round Cafe" Serves Food on Rotating Counter

The new Merry-Go-Round cafe counter which serves food to customers by means of glass enclosed compartments rotating around inside of counter. Diners lift compartment covers and take out the food they want. An electric motor geared to endless chain keeps counter in constant motion at proper speed. Customer is permitted to eat as much as he wants for fifty cents.

"ALL you can eat for fifty cents" is the slogan of the new Merry-Go-Round Cafe counter, recently patented by a Los Angeles inventor, which conveys the food around before the customer in a series of rotating glass enclosed compartments. These compartments are filled with various kinds of food, such as pies, salads, fruits, etc., which customers help themselves to as the case passes before them. On top of these compartments, which form an inner counter, are sugar bowls, napkins and silverware, and salt and pepper.

The compartments are mounted on an endless chain, moving over a series of rollers, and are operated by an electric motor which keeps the inner mechanism always in motion at a proper speed.

Aquaplane Propelled by Outboard

PROVIDING all the thrills of riding behind a speedboat, a new self-propelled aquaplane driven by an attached outboard motor has been devised for water sports. The plane will do 35 m.p.h. and is perfectly safe.

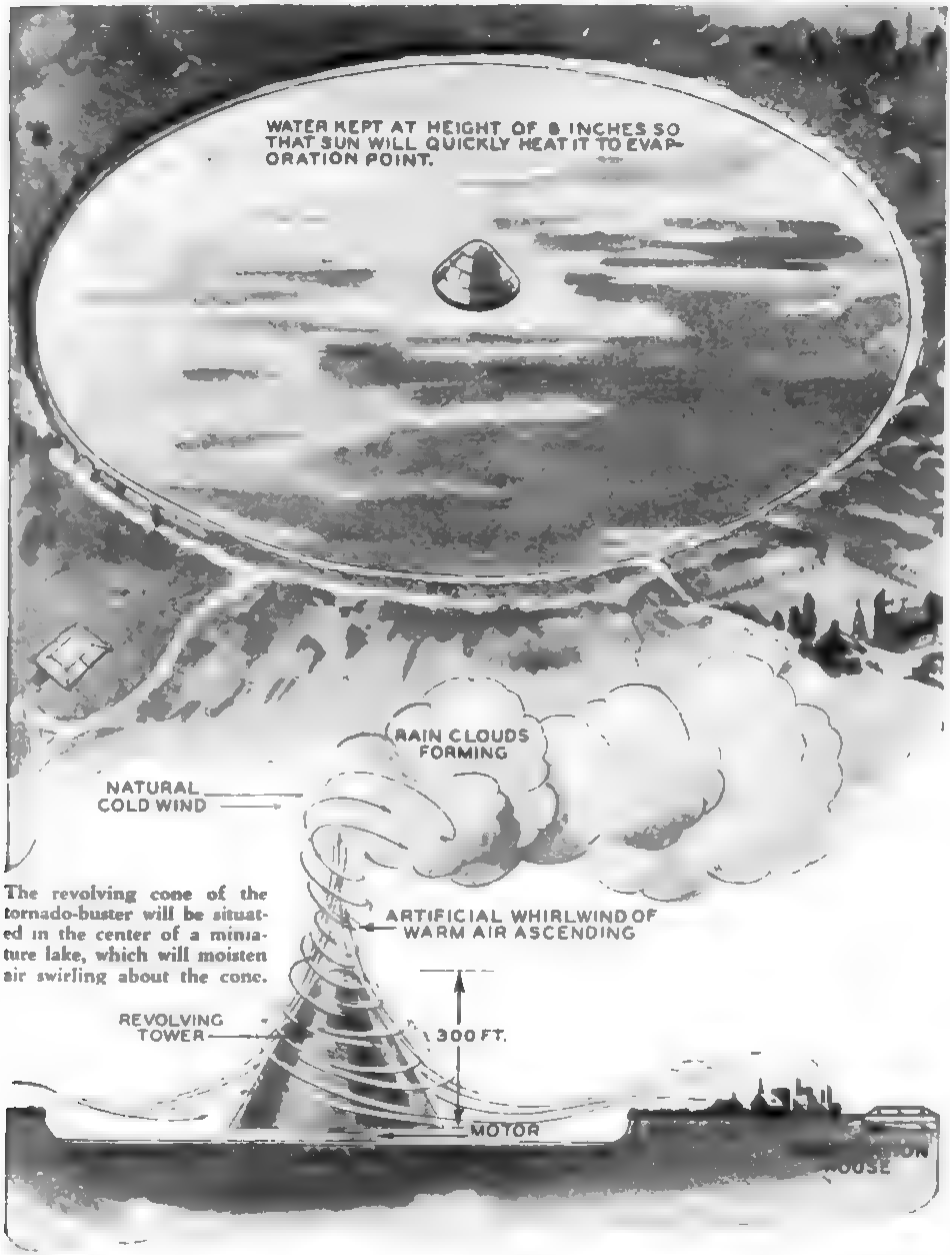
Powered by attached outboard motor, this self-propelled aquaplane will do 35 miles per hour.

Manicure Fad for Bridge Players

AND now comes the bridge manicure — the latest bright idea which adds to the fun of the game for bridge addicts! In this fad, to have your nails properly manicured for a bridge game you must have a heart, a diamond, a spade and a club enameled on each finger nail, and a question mark on the thumbnail for no-trumps. The photo at the right shows Miss Martha Zamm of Los Angeles, originator of the fad, with fingers properly decorated for a game. Symbols are painted in black on the nails.

Miss Martha Zamm, with her finger nails painted with card symbols for bridge.

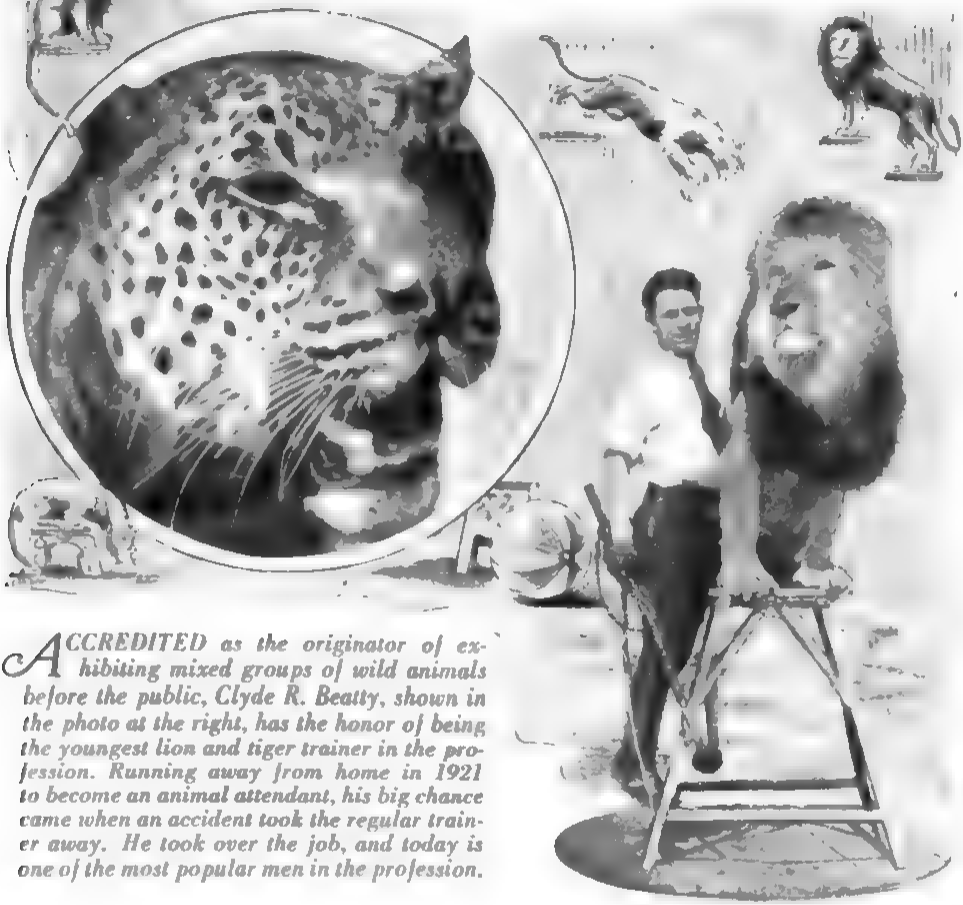
"A Tornado BUSTER" for the Mid-West



The revolving cone of the tornado-buster will be situated in the center of a miniature lake, which will moisten air swirling about the cone.

The above drawing illustrates the scheme proposed by Hans Kutschbach to prevent tornadoes in the Mid-west. This scheme, a modification of a similar project by Dessoliers, a French engineer, calls for the construction of a huge revolving cone that will serve to produce artificial whirlwinds, or potential tornadoes. The moist heated air from the surface of the lake swirls about the cone, then rises to the sky, thus equalizing the atmospheric pressure. The advantage of this scheme lies in the fact that the cone virtually holds the potential tornado stationary, so that it does no damage.

The Mechanics



ACCREDITED as the originator of exhibiting mixed groups of wild animals before the public, Clyde R. Beatty, shown in the photo at the right, has the honor of being the youngest lion and tiger trainer in the profession. Running away from home in 1921 to become an animal attendant, his big chance came when an accident took the regular trainer away. He took over the job, and today is one of the most popular men in the profession.

SPORTSMEN and naturalists can rave all they wish as to which is the King of Beasts. My own hat is always off to the lion. Twice now, I owe the species my life and that's excuse enough for any man's esteem.

When the Hagenbeck-Wallace circus opened in Texarkana last spring, the big crowd thought it part of my act when a huge Bengal tiger bowled me over and seizing me about the waist, began trotting round and round the arena.

It wasn't until the next day that the public learned what really happened. As for me, I knew I was so near death that I was nauseated. I could feel that big cat's teeth stabbing through my wide leather stomach belt and every split-second I expected the crunch which would end everything. My assistants outside the arena were so paralyzed with terror they forgot the part expected of them when accidents happen.

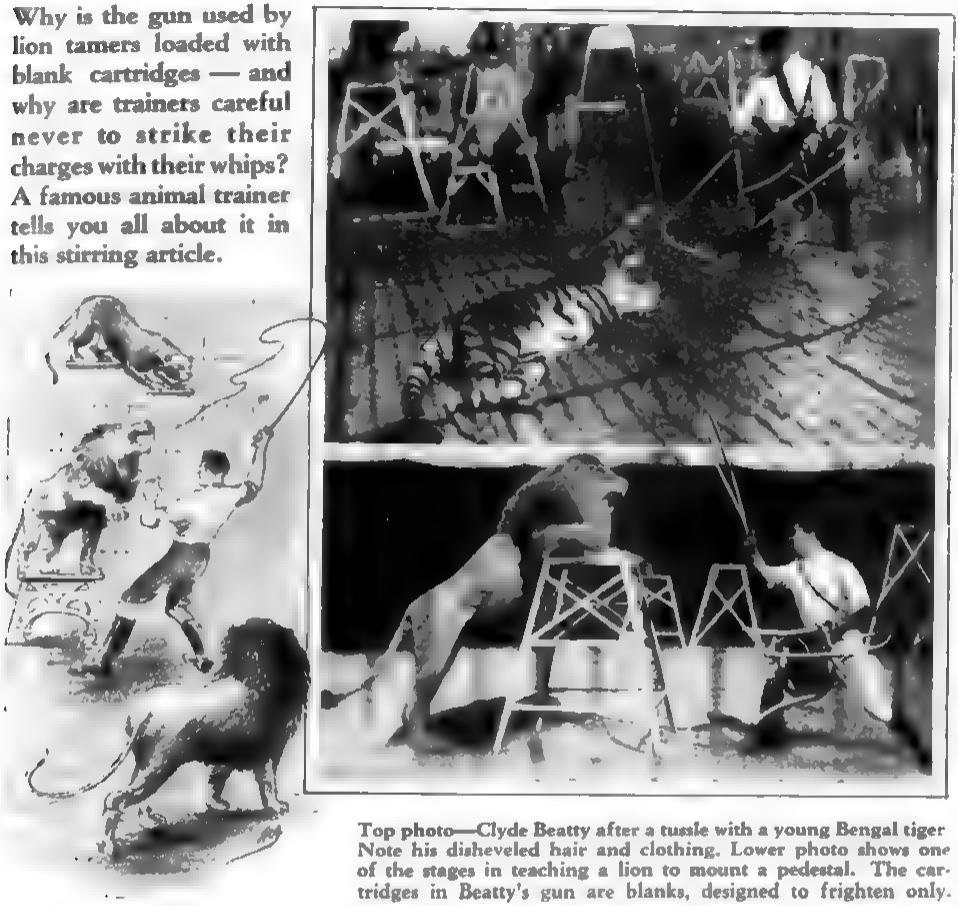
Fortunately for me, there was an enormous Nubian lion in that mixed group of 32, who knew that things weren't going according to usual schedule. Although he and I had always been somewhat friendly I'm not saying, mind you, that he deliberately acted to save my life. What he probably figured out was that here was his chance of a lifetime to prove a lion's instinctive hatred for a tiger, now that I seemed unable to hold him back.

At any rate, with an ear-splitting roar, he

# of Lion Taming

by **CLYDE R. BEATTY**
Famous Animal Trainer

Why is the gun used by lion tamers loaded with blank cartridges — and why are trainers careful never to strike their charges with their whips? A famous animal trainer tells you all about it in this stirring article.



Top photo—Clyde Beatty after a tussle with a young Bengal tiger. Note his disheveled hair and clothing. Lower photo shows one of the stages in teaching a lion to mount a pedestal. The cartridges in Beatty's gun are blanks, designed to frighten only.

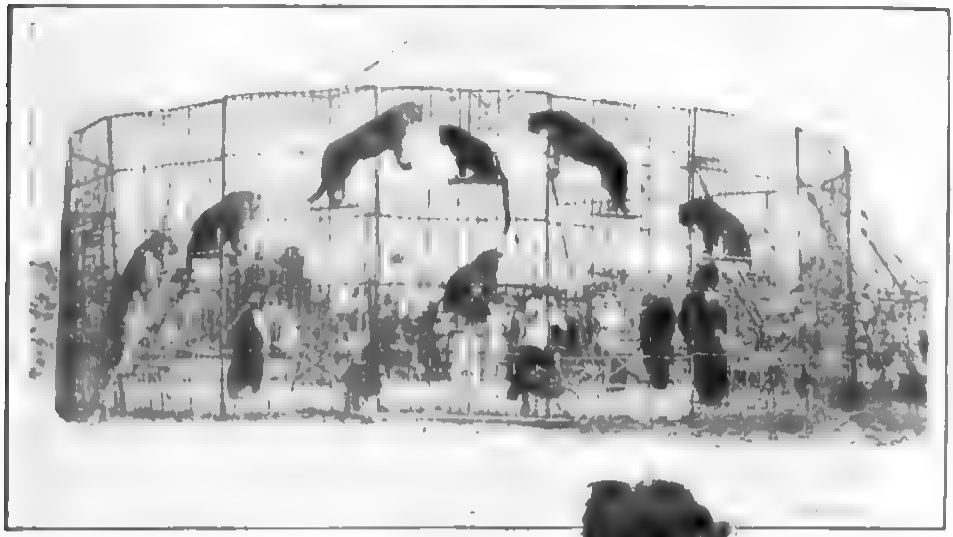
launched down from his pedestal and landed fair and square on the cat's back. The tiger dropped me instantly and turned to defend itself. What a fight followed!

Stunned and badly wounded, I cowered on the floor while those two maddened beasts clawed, slashed and tore at each other with my body under their flying feet. Over and again, their terrible claws punctured me as they sought to keep their footing.

Fortunately for me, the tiger suddenly gave way before the lion's terrific attack. Somehow I staggered to my feet and drove them to their respective runways which my panic-stricken attendants suddenly remembered to open. Then I herded the other thirty animals out of the arena and collapsed before the door. My helpers dragged me out and hustled me off to the hospital where I spent the next two weeks.

I'll carry the scars of that adventure until I die. So will the tiger, for the Nubian had nearly killed him before I was able to get up and whip them apart. It has always been a miracle to me that the entire group didn't participate in one grand free-for-all while I lay helpless on the floor.

Explaining how lion and tiger are trained isn't an easy thing because there aren't any trade secrets to divulge. It's just a matter of being foolish enough to walk in with them and daring them not to attack you as they



A particularly dangerous stunt, originated by Trainer Beatty, is the one pictured above in which a mixed group of animals is exhibited. Lions, tiger, leopard, panther, and bear are represented.

naturally prefer to do. Making them jump up on pedestals or through hoops or do any of the other stunts is largely a matter of persistent trying and no end of patience. Unlike a dog, they aren't eager to please any man and their seeming obedience is largely rendered because they wonder what would happen if they didn't obey.

The big thing, of course, is to make them let you alone. Nature ingrained them with a hatred and suspicion for man and that animosity takes one of two channels—they either want to attack you or else run away. Their reaction to your command isn't the willingness of a horse to "giddap" or "whoa"—rather it is the reluctant submission of brute-strength to human will-power. Their fear, as it were, of what might happen if they didn't do what was asked of them.

That fear, however, is a laughable thing when you analyze it and if they only knew the truth no trainer's life would be safe. The whip he carries is no weapon at all and in case of a showdown, utterly useless to repel a beast capable of a mighty spring which would knock a horse down. But it makes a lovely "crack!" when handled right and suggests unknown possibilities to a furtive-minded animal.

Nothing could be more absurd and harm-

Beatty handling a leopard cub — with gloves.

less than the chairback we invariably carry in with us, but because they cannot understand what it is they are afraid of it when it is suddenly extended to them. In case of need, a dishpan would be equally as effective a weapon—in fact, the glitter of bright tin would be better to startle them off with.

It is the assistants outside who are alone capable of punitive assistance in case such a thing were needed when an animal turned on its trainer. But the trainer himself is

really helpless. To inflict any sort of pain while alone in an arena would be to tempt Providence itself. The very pistol we carry is always loaded with blanks and if fired in the face of an angry animal, is more apt to prove a spur than a deterrent.

My own assistants are carefully coached never to enter the arena itself in case of mishap or accident to me. They can serve me best from the outside by flinging open the runway gates leading back to the pens and attempting to drive the animals out of the arena. It is a circus "law" that the trainer stands on his own legs when he enters a cage or the arena.

I have encountered a few members of the cat family who really went out of their way to be friendly and half-affectionate. But their moods are not to be trusted and unfortunately, they have no realization of their strength. Thus, their enthusiasm is more to be feared than downright anger. Any cat can bowl a man over with a flip of his tail and even a friendly

Top photo—Leo doesn't want to mount the pedestal, but he's fearful of the chair legs and Beatty's crackling whip—which never touches him. Lower photo — A lion being backed into his runway.

This tiger is returning to his runway after the act.

tap from their mighty paws would splinter wood. Their claws are horribly sharp and hawk-like in action whenever they encounter soft flesh. If they were to draw a single drop of blood in a moment of friendly exuberance, tragedy might quickly follow, for the smell awakens their primitive instincts.

It was a friendly scuffle with a young cub lion that nearly cost the life of Charles Gay, owner of the famous California lion farm. The cub enthusiastically cuffed at him and entangled a claw in Gay's bootlace. In an effort to extricate it, he sank the claw into the calf and blood streamed out. In an instant, the friendly beast became a raging, carnivorous animal. Gay spent weeks in the hospital.

My own first accident with lions was largely the result of too much faith in the friendliness of an especially fine Nubian lion. In the group I happened to be working that day, was a lioness who suddenly came in season. She remained beautifully aloof to his sudden advances and it angered him to the point where he vented his ire on me.

Knocking me down, he nearly tore my right arm off and his big teeth punctured it through and through. Things looked like the end for me when suddenly that lioness took it in her head to play the coquette. She

Training Begins Early for Cubs Born to the Circus

These two leopard cubs look kittenish enough at their present age—but even now, with their eyes hardly opened, their claws are sharp and hawk-like, and the smell of blood rouses their ferocious instincts.

leaped down from her pedestal and started to cavort around him as he was chewing at me. That excited him so he turned away and I did a nose-dive for the door. That was at Kokomo in 1925 and put me abed for a long siege.

Exhibiting mixed groups of animals in an arena is one of the toughest and most dangerous jobs we trainers do and I've about concluded never to work such an act again. The public neither appreciates nor understands the truly great risk we run and because it is their plaudits I am after, I've come to some definite conclusions about preserving my skin hereafter.

The lion and tiger are natural enemies and making them work peacefully together is exactly like trying to keep dynamite and a percussion cap from exploding. Throw in some leopards, a few panther and a bear or two into one enclosure and you've got all the natural makings for a better rough-house than any Irishman could ever want. The very air in the arena crackles with hatreds when such a mixed group is driven in.

Circus men said it couldn't be done when I first tackled the stunt back in '23. Well, I didn't know what would happen myself when I tried the stunt out at the training quarters. All I knew was that I wanted to give the public a big thrill, and I certainly got one myself when they shoved a few lions and tigers in with me. Of course, I chose well-trained animals whose dispositions were better than the average for the first experiment. But at that, I had my hands full that day and I've had them full every time I have worked the stunt since. You can imagine my feelings when I added leopard and bear later on!

There are no vacations to speak of in our profession. All the year round I must keep in close association with the animals I work. Their memories are too short and their moods too variable. They must be put through their paces as often as possible for lengthy letdowns are dangerous. It is only during stormy weather that I can relax and take things easy. The approach of a storm makes them restless and uneasy and their high-strung nature won't permit intimate contacts then.

An animal trainer's first consideration must always be for the safety of the spectators watching his act. This is another reason why the revolver I carry in my act is loaded with blank cartridges. Supposing a tiger were to charge me, and I fired a bullet at him. In the first place, it is extremely unlikely that the lead slug would have the effect of stopping the animal in his tracks before he could maul me. A case, not at all unusual, is on record where a tiger, carrying seven heavy bullets in his body through vital spots, ran for fifty yards before dropping. So you can see why a blank shot, with its frightening concussion, is just as effective for a trainer as a real bullet.

But, to get back to the story, supose I *did* fire that bullet, and it went wild and struck some member of the audience in the closely-packed circus tent. By any sense of justice, the animal trainer who has lost control of his charges is the one who should pay the penalty, not some innocent bystander. It is part of the odds the trainer accepts when he steps into the cage.

I may flirt with death a bit oftener than the average man but there is one nice thing about "cat" training—insurance men never pester me to death!

"Ether Wave PIANO" Plays all MUSIC

Maurice Martenot playing his new ether wave radio piano, which reproduces tones of any musical instrument or voice. Inset shows oscillating radio tubes that create a wide range of musical tones.

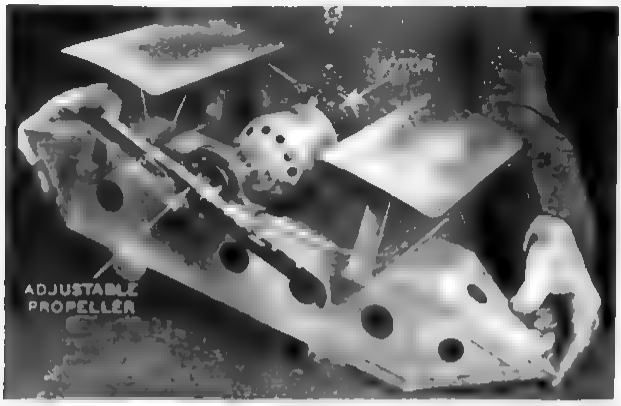
MUSICAL sound waves are literally created from the ether with the new Martenot radio piano, which recently entertained radio audiences in a program given by the inventor, Maurice Martenot, in conjunction with a popular symphony orchestra. Claimed to be the most outstanding musical invention of the twentieth century because of its ability to reproduce the tones of any musical instrument or voice and to create entirely new tones, the device is operated by direct mechanical control of a series of oscillating radio tubes, which generate the sound waves of variable pitch and volume.

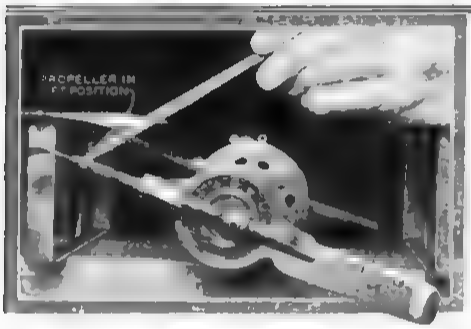
The keyboard of the instrument is used as the scale, and the position of the forefinger of the right hand above it regulates the tone produced. Attached to the finger are two finger pieces, connected to a cord that operates a series of condensers in the instrument, thus varying the capacity, and hence the frequency, of the radio circuit.

Pitch of the instrument is varied by moving fingerpiece to left or right, as shown above. Slightest touch of finger on lever at left controls volume.

Volume is controlled by means of a lever at the left hand side of the instrument, its range being from an almost inaudible pianissimo to a ringing fortissimo. Staccato notes are produced by tapping the finger on the volume lever. The rheostat permits the notes to be cut off at will by breaking the plate circuit of the amplifier. Very little effort is required in playing this instrument; an apt pupil can learn to play it easily in about four months.

The Propellers Do All the Work on This Novel Airplane





A model of Mr. Johnson's novel plane, showing the small wing surfaces and large adjustable propellers.

The propeller is here shown in a position to lift the plane straight up into the air. The propellers will also be used for steering the odd craft.

THE enthusiastic type of inventor who used to sink his labor and funds in the attempt to produce perpetual motion, now uses up that energy and money in the hope of solving the problem of vertical flight. One of the latest attempts, illustrated at the left, is that of E. P. Johnson, of Chicago, who has spent fifteen years and $50,000 on the experiment.

Unlike other airplanes, this job has no rudder for steering, and the wings would be used only in case of emergency; otherwise the two large propellers would do all the work. By shifting the pitch of the propellers it is hoped that this ship can ascend and descend vertically, while steering will be done by varying the speed of the airscrews.

Why Kansas Has No More Mirages

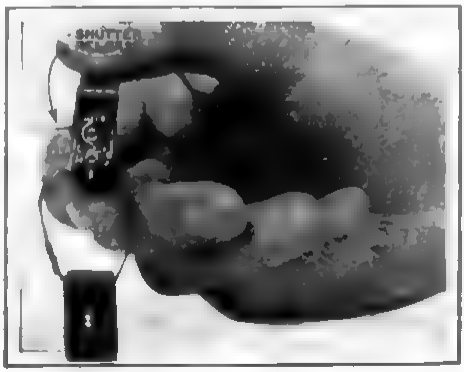
THIRTY or forty years ago mirages were frequent in the plains country. Usually the mirage was that of a lake, perhaps with distant mountains reflected in its mirror-like surface. Not infrequently images of distant towns or ranch houses could be seen; sometimes right side up, sometimes inverted.

Mirages are caused by different temperatures in layers of air close to the ground so that light rays from distant objects are bent upward or downward by these temperature differences. In former decades the surface of the prairies in Kansas and Texas was unbroken by the plow. Every few years it was burned over by the prairie fires so that grass and bushes were destroyed. The hard, smooth surface of the ground was heated by the sun and heated the air next to it. This caused the mirages, which are now ended forever by the plowing of the land.

The World's Smallest Camera

WHAT is probably the world's smallest camera is illustrated below. This camera was made by the Eastman Kodak company and is a masterpiece of construction; being no larger than a thumb nail, and yet perfect in every detail and capable of taking pictures which are mechanically perfect.

Three months were required in the construction of this midget, every part having been made by hand. A leather case, with a finger loop, has been made to hold it.



Jeweler's tools and a microscope were needed to construct the mechanically perfect camera shown.

German Architects Develop Unique, Low-Cost Buildings

ECONOMIC conditions in Germany since the war have compelled German architects to develop a type of architecture that is distinctly different from any types appearing before in any country. Eliminating all frills and unnecessary ornamentation, builders are erecting business buildings, apartment houses, warehouses, etc., that have practicality as their chief feature.

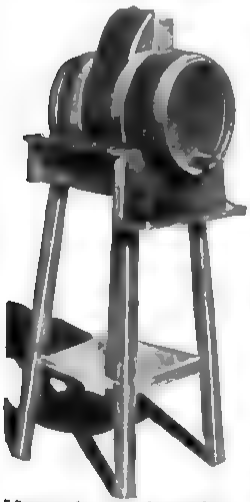
The architects have compromised on structures which have a simple charm all of their own. This new type of architecture is exemplified in the building shown in the photo at the right.

The new style architecture developed by German builders is exemplified in this Berlin department store. Cheapness of construction is achieved mainly by extensive use of glass for walls as shown.

37-Knot French Destroyer

THE fastest man-o'-war in the world, the French destroyer, *Bison*, capable of a speed of 37 knots, was recently put into service. Her engines develop 66,000 h.p., and she can fire six torpedoes at once. The ship was built at the naval arsenal at Lorient, France.

Old Keg Makes Novel Waste Basket



Mounted atop the walnut stand as shown, this keg makes an attractive and serviceable waste basket. The bung is left in place to add realism.

A UNIQUE and attractive waste basket for a den can be made out of an old keg of the type used to hold paint or, in bygone days, beer. The lid should be replaced in the top and a bung inserted for attractiveness, as shown in the accompanying drawing.

The stand should be made of walnut. The shelf below serves not only as a reinforcement but also as a magazine shelf. The finished item is most attractive when painted blue.

Helium Gas Has Important Use

HELIUM gas, long a rare product, promises now to become a plentiful and important industrial material. It is being used in medicine, in chemistry and in mechanical engineering, but its most important service is in the lifting of giant airships such as the *Los Angeles* and the *Graf Zeppelin*.

Crashing a Zeppelin for

Jealously guarded secrets of the amazing Zeppelin crash in "Hell's Angels" now revealed to Dick Cole by Howard Hughes, the producer of this spectacular movie.

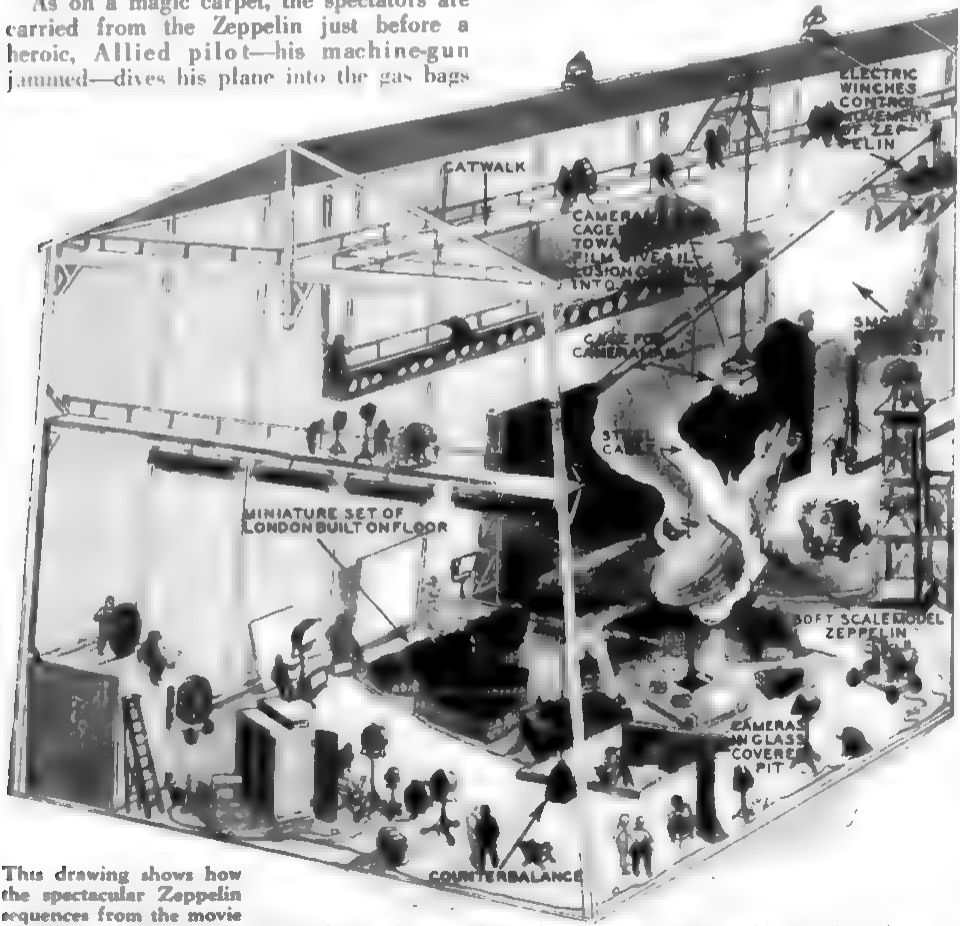
"WASN'T it marvelous! How in the world did they ever take it?"

Such exclamations and questions are heard on every side as a teeming crowd pours forth from a theater after seeing "Hell's Angels"—the outstanding aerial war picture of the day. And it is little wonder! For several hours the spectators have been soaring 10,000 feet above the earth in a huge, wartime Zeppelin, or they have been sky-riding in a giant bombing plane.

As on a magic carpet, the spectators are carried from the Zeppelin just before a heroic, Allied pilot—his machine-gun jammed—dives his plane into the gas bags of the airship. The aerial juggernaut comes hurtling out of the skies, a huge, flaming hulk; crashes to the earth with a deafening roar—a twisted mass of glowing wreckage.

This is but one of the breath-taking scenes from "Hell's Angels." Again the puzzling question: "How in the world did they take it?"

Of course, anyone's ordinary reasoning power tells one that it was not a full-size, man-carrying Zeppelin that fell from out the



This drawing shows how the spectacular Zeppelin sequences from the movie "Hell's Angels" were taken. A 60-foot scale model Zeppelin was suspended by cables in a huge hangar, chemicals to produce smoke clouds were installed, and other details carried out as explained here.

FUN

by **DICK COLE**

who gives you a look behind the scenes of the most spectacular air thriller ever made.

The scale-model Zeppelin is shown above as it first appears on the screen. The clouds are created by chemicals used in aerial skywriting.

skies. But, to believe so, is no more erratic than to believe the know-it-all, wise guy, who tells you in tones of belittlement: "Huh! It was just faked! I know! That was just a toy balloon that they used."

Both beliefs are wrong. It was done by scale model photography. This is not comparable at all to the crude miniature stuff that is injected from time to time in pictures, and which often changes a tragic situation into a comic farce. Nor are scale models employed solely to keep down production cost. The primary purpose is to put across a scene with greater realism and finer photographic values. The use of scale models should not imply belittlement.

In producing "Hell's Angels," it was entirely within the range of the pocket-book of the producer, Howard Hughes, to buy and to wreck a full-size Zeppelin. But, even so, the film record would not be comparable with that recorded with the use of the scale model. In the latter case, the entire set was under the complete control of the director; the set was lighted to give the best photographic values; close-up shots of the Zeppelin falling in flames and its ultimate crash to the earth were taken with precision; all of which would have been impossible if a full-size airship were used, to say nothing of the hazard to life and property.

To produce the Zeppelin scenes, Mr. Hughes gathered about him a staff of the cleverest technicians in the United States. A model Zeppelin was built—an exact replica of a German, wartime dirigible. This was built to a scale of one foot equals one inch. So the model was approximately 60 feet long and 6 feet in diameter. Quite a sizeable "miniature"! Even the framework followed closely the true Zeppelin design.

The huge dirigible hangar at Arcadia—adjacent to Los Angeles—was leased from the government, and in this building all the scenes of the Zeppelin were shot. Lights giv-

Elaborate Model of London Used as a Background for Zeppelin Attack

A miniature set of London, like the one shown above, was installed on the floor of the hangar. Note the Houses of Parliament in the foreground, with the Thames river in the distance

The 60-foot model in flames—spectacular end to the Zep crack-up.

ing millions of candle-power were installed Miniature sets were laid out on the floor to give suitable back-ground for vertical shots of the "Zep." Chemical apparatus was installed to create clouds. A steel cable was stretched from one corner post to the middle of the opposite wall. The Zeppelin was suspended from a trolley which traveled on the cable. It could move along the cable about four times its length. Other cables permitted the Zeppelin to be raised or lowered at the will of an operator at an electric winch. Runways—or balconies—completely around the inside walls of the hangar, were vantage points for the numerous cameras. In addition, portable, parallel platforms could be moved anywhere on the floor. A cat-walk near the roof of the hangar was utilized for vertical shots.

In presenting the picture on the screen, the Zeppelin makes its first spectacular appearance emerging from a fleecy, cumulus cloud. The clouds are seen to roll back as the nose

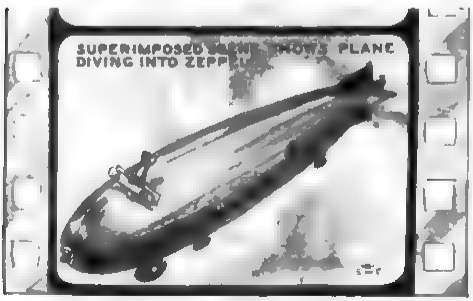
of the airship pushes through. This is a close-up shot, and so real that it seems the Zeppelin must leave the screen and soar into the auditorium of the theater.

How was it done? The Zeppelin is at the end of the cable farthest from the camera. Immediately in front of the airship a dense cloud of "liquid smoke" is released. This is the chemical used for laying down a smoke screen or for "sky-writing." This gas remains as a gaseous mass for some time before diffusing into the air. The Zeppelin is slowly drawn through this "smoke." Vivid lighting effects reproduce the smoke as a cumulus cloud.

Next, the spectator is permitted to ride in the "Zep" and see its inside workings; the skeleton framework; the gas bag; the power gondolas.

Double Exposure Used to Film Crack-up

The Zeppelin at the moment it bursts into flames. Pulling a prop released supports inside the model airship which broke its back and ignited it.



How double exposure was used in the scene.

The motors are running—real motors. One sees the rocker-arms rock, and hears the clicking tappets. On the model Zeppelin, the propellers are turned with quarter H. P. motors. The interior sets of the Zeppelin were built full size.

The "Zep" cruises on its way. London is its objective. A member of the crew is lowered thousands of feet in a gondola suspended by a slender cable to get their bearings. The object is to drop bombs on Trafalgar Square. The observer revolts at bombing a sleeping city. He telephones misinformation to the Zeppelin, and the bombs drop and explode harmlessly in a lake. But the Allied flyers are aroused. They take to the air in their fighting planes to battle the Zeppelin. A terrific aerial battle rages. The "Zep"

(Continued on page 202)

Sky Student Makes Telescope From Plumbers' Materials

Leo Scanlon, Pittsburgh plumber, is shown studying stars through his telescope, made from pipes, elbows, brass tubing and other plumbing materials.

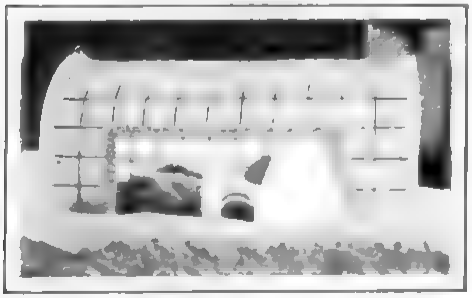
WHAT is probably one of the world's most unique telescopes has been built by Leo Scanlon, a plumber of Pittsburgh, Pa., from materials and tools used in his business—plumbing pipes, brass tubing, elbows, metal from discarded water tanks, and other such parts being the chief ingredients. The telescope, which has a ten-inch lens, and magnifies the stars 400 times, will be used by a group of amateur star students, headed by Scanlon, who is also one of the organizers of the astronomical section of the Academy of Science and Arts at the Carnegie Institute.

Operating in a manner similar to that of the huge telescopes used by professional astronomers at the large observatories, Scanlon's scientific instrument has a main barrel made from brass tubing, as shown in the photo at the left, and an eyepiece made from small pipe.

Clam's Shell Gives Health Rays

PANELLING made from the tough, translucent shell of a large Philippine clam is now being used as a filter for sun rays, and is said to transmit all of the healthful ultra-violet and infra-red rays.

The material is light in weight and non-shatterable, and is claimed by the manufacturer, who makes it in any size, to be five times as strong as ordinary window glass. It is opaque, making a private sun bath possible anywhere the sun's rays are available. The new material is especially suitable for construction of sun porches and greenhouses.



This sun-bath house has panes made from Philippine clam shells which are opaque, but transmit sun's ultra-violet and infra-red rays.

Golf Cup Ejects Ball Up Into Air

A NEW golf cup recently invented which automatically ejects golf balls makes it unnecessary for players to stoop and soil their hands in picking up the ball. All that is necessary is to touch a button in the bottom of the cup with a putter and the ball flies up into the hands of the player. The cup has a hole beneath which is a hammer which is thrust upward by a spring when the button is pressed, throwing the ball three feet into the air, as shown in photo.

When player touches button in this golf cup with putter, the hammer throws the golf ball up in the air.

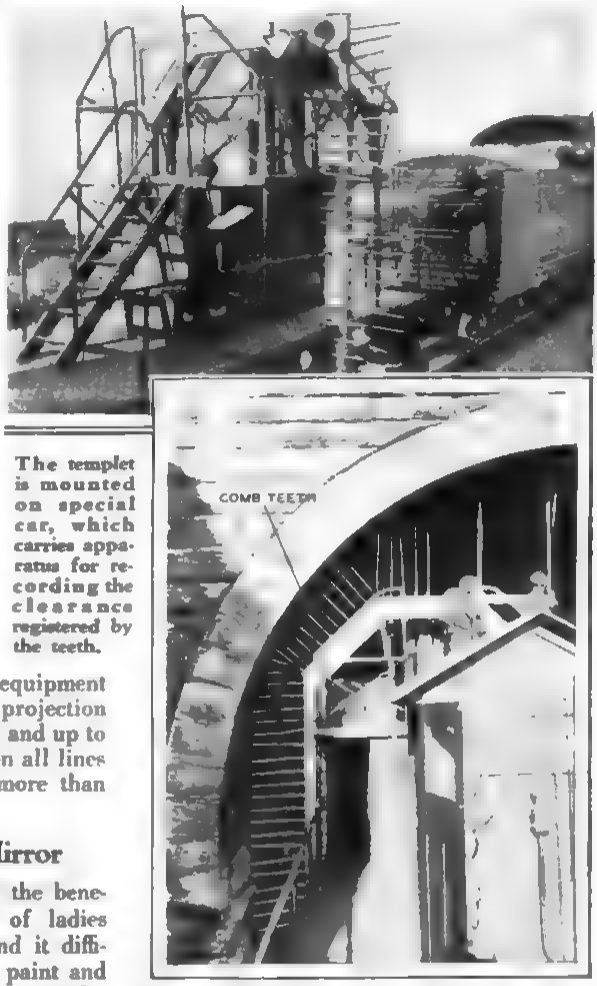
New High Speed Star Camera Lens

THANKS to a recently developed high speed lens, astronomers at the Mount Wilson observatory are now able to clock nebulae traveling 8000 miles per second. Heretofore speeds of only 2400 miles per second were recorded.

Mammoth Steel Comb Device Measures Track Clearance

RAILWAY engineers have recently perfected a giant combing machine with which to measure exact clearance along the quarter of a million miles of railroads in the United States, and thus permit larger and more powerful locomotives to operate on fast schedules with complete safety. By use of 79 projecting teeth, accurate measurements of the distance from the track to every object, both overhead and alongside, is charted.

Designed by Alexander Whilldin, clearance engineer of the Pennsylvania Railroad System, the car which transports the measuring equipment is of special build, made of steel parts with a templet, the frame of which permits measurements to be taken quickly and easily. This templet holds the 79 measuring teeth, being a rigid upright framework made from steel "I" beam erected immediately over the forward trucks of the car. With this equipment the engineers will measure every projection higher than 3 inches above the rail and up to 21 feet 6 inches above the tracks on all lines of the system, which aggregate more than 50,000 miles.



The templet is mounted on special car, which carries apparatus for recording the clearance registered by the teeth.

Clearance above and on both sides of the track is measured with the projecting steel teeth, mounted on iron template as shown in above photo.

Flashlight Has Metal Mirror

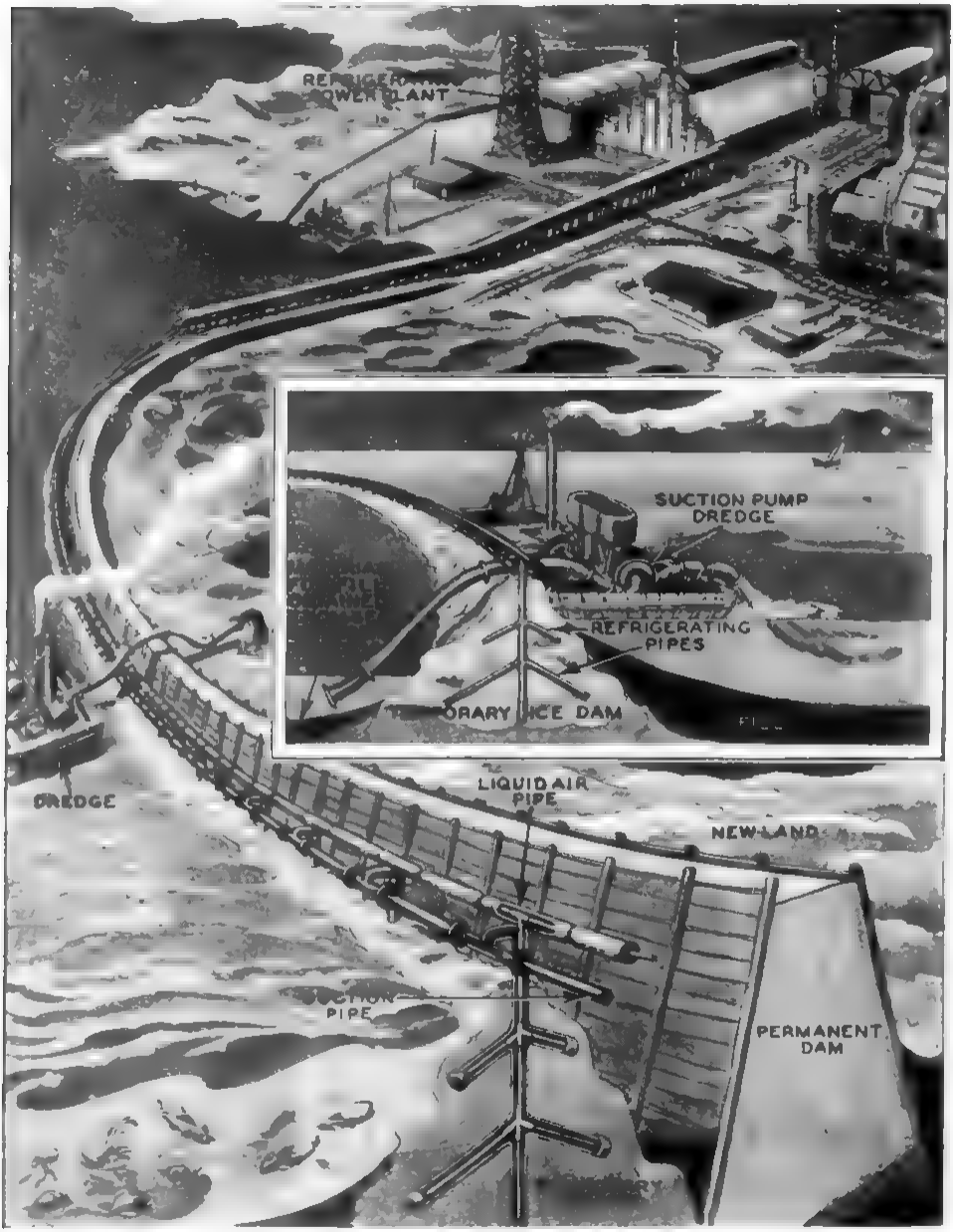
Lifting mirror lights bulb.

FOR the benefit of ladies who find it difficult to paint and powder in the dark, a small flashlight which carries a metallic mirror has been invented. The mirror is hinged, and has a projecting lug which makes or breaks the electrical circuit, so that when opened up it turns on the juice. The device has also the usual button.

New "Radio Pillow" for Hospitals

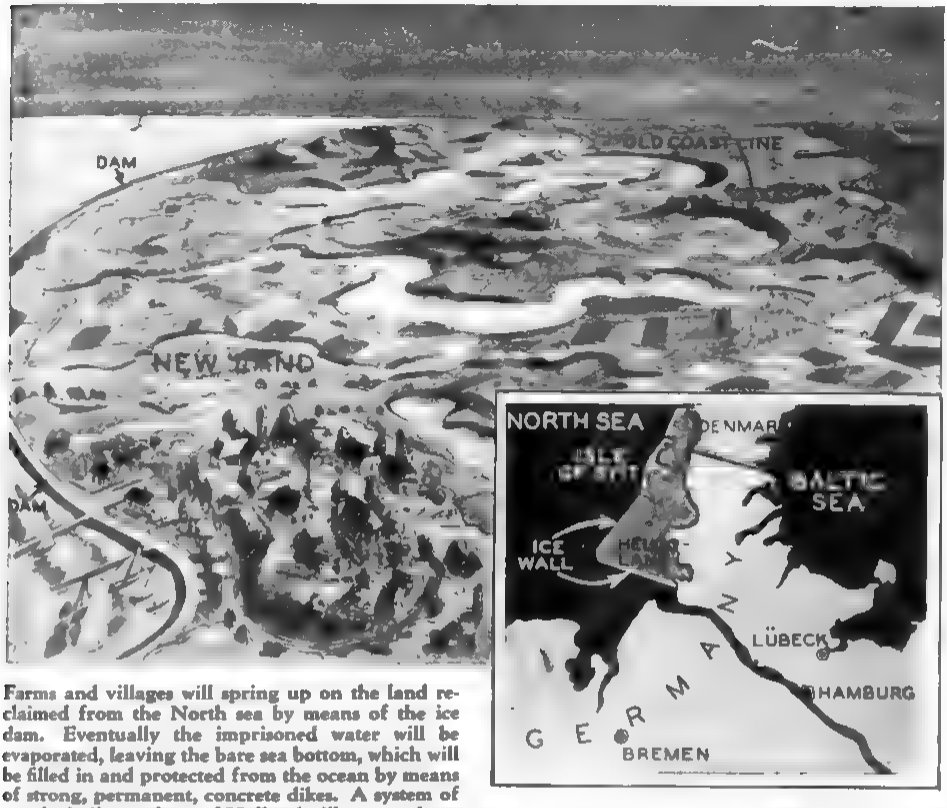
A SINGING or talking "radio pillow" for use in hospitals and Pullman cars, where loudspeakers would be unsuitable, has just been developed by radio engineers. This "radio pillow" is of regulation hospital size, and is made of specially selected sponge rubber in which a sensitive reproducing unit is concealed, which does not operate unless the head is rested on the pillow. A connecting cord is plugged into a centralized radio receiving system.

LIQUID AIR to RECLAIM



In carrying out the proposed project of the German engineers to convert North sea area into habitable land area, with liquid air, a pipe line will be erected inclosing the portion of the sea as illustrated above. Salt water coming into contact with the pipes, which have been reduced to a temperature of 180 degrees below zero by the liquid air, will freeze and form a dam of solid ice. A dredge will then fill in the enclosed area with earth, drawn from the sea bottom with a huge suction pump.

LAND *from* NORTH SEA



Farms and villages will spring up on the land reclaimed from the North sea by means of the ice dam. Eventually the imprisoned water will be evaporated, leaving the bare sea bottom, which will be filled in and protected from the ocean by means of strong, permanent, concrete dikes. A system of canals similar to those of Holland will serve to keep the land drained, as illustrated in above drawing. The old coast line is shown in the background.

The above map shows the portion of the North sea which engineers propose to reclaim by the construction of the ice wall and concrete dam.

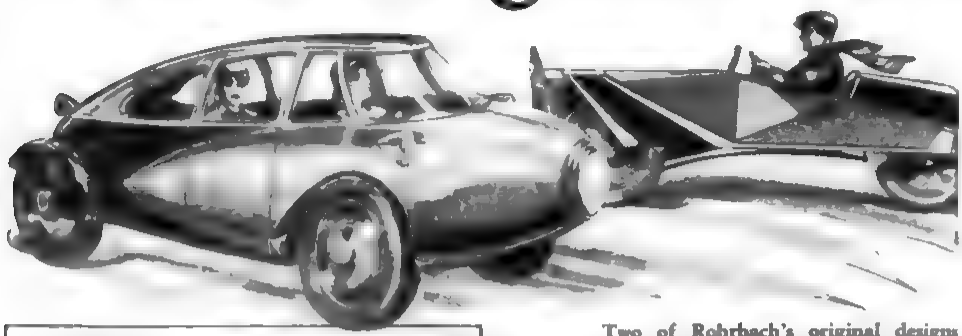
ONE of the most astounding engineering feats of recent years—that of building a wall of solid ice with liquid air around a large portion of the North Sea—is now under consideration by German engineers. Adding thousands of acres to the continent of Europe, the ice dam will serve as a breakwater to enable the engineers to construct a permanent inner dike of concrete, and then proceed to fill the inclosed space with earth sucked up by a dredge from the bottom of the sea outside the ice wall, as illustrated in the accompanying drawings.

Engineers will set about building the ice dam by erecting a pipe line out into the sea to carry liquid air, which will reduce the temperature of the pipes to approximately 180 degrees below zero. The sea water coming in contact with these pipes will congeal into ice, and the waves will then tend to form a solid ice wall to serve as a breakwater for the inclosed area.

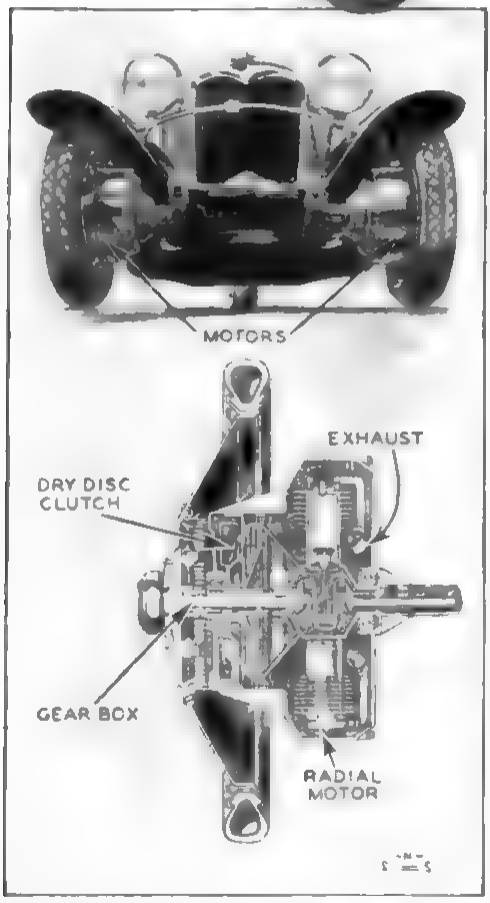
This much accomplished, engineers will then build a permanent concrete dike inside the ice wall, and by means of a suction dredge fill in the reclaimed area with earth sucked up from the bottom of the sea outside the wall.

This project, if proven feasible in preliminary experiments, will first be carried out in the North sea, shown on the map above, where for centuries the Germans have been trying to win land from the ocean. Liquid air will be supplied by refrigerating plants on the shore, and the pipe line will extend out beyond Helgoland and back to the mouth of the Weser river.

MIDGET CARS with



Two of Rohrbach's original designs of light, three-wheeled motor cars.



Above is a front view of Rohrbach's latest light car design. Two 3-cylinder radial motors furnish power directly to the non-steerable front wheels which are mounted on long cantilever arms which take the place of springs. Below is shown a cross section of the motor, clutch, and gear box mounted on the front wheel.

WHY should the automobile you drive to work in the morning weigh a ton or more, be pushed along by cumbersome shafts and gearing, be powered with a heat engine which actually wastes more than half of the heat, or consumes more than twice the fuel it should, be equipped with four expensive tires and wheels when three would do, and require ten to fifteen feet of valuable curb space to park?

Why should your car be slung on steel springs that are merely enlarged replicas of the old springs of horse and buggy days, and then force you to buy air or liquid or spring or elastic shock absorbers to correct their faults?

Why should an engine be placed up in front with its shaft running lengthwise of the body and the power then carried back to the rear axle or forward to the front one and turned at right angles through power wasting bevel gears? Why not place the motor in line with the axle, its shaft in the same plane, and deliver the power direct to the wheels?

Or, better still, why have an engine in the body of the car at all when you can have two smaller motors built right into the wheels, and eliminate all shafts, gears, and differential?

When you get down to that point you can eliminate the axles, in the ordinary sense.

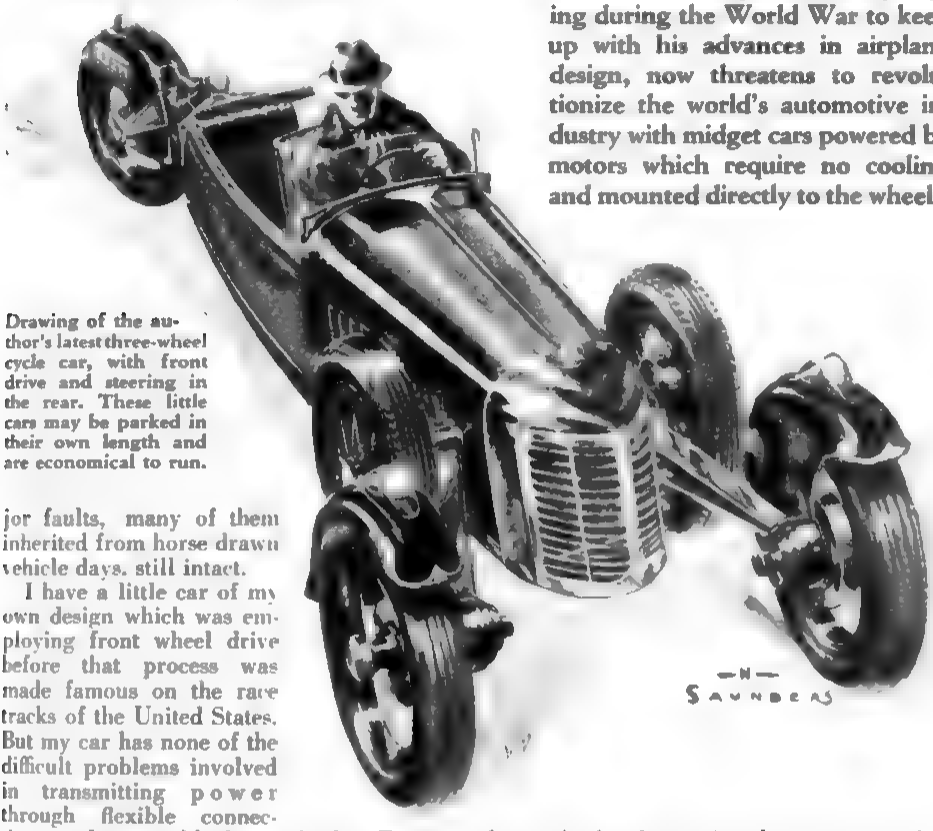
Those are some of the problems I have been working on in Germany for the last seven years. The automobiles of the world have been more or less standardized during that time, standardized with all their ma-

Motors in the WHEELS

by HANS ROHRBACH

Noted German Airplane Designer

The man who kept the Allies jumping during the World War to keep up with his advances in airplane design, now threatens to revolutionize the world's automotive industry with midget cars powered by motors which require no cooling and mounted directly to the wheels.



Drawing of the author's latest three-wheel cycle car, with front drive and steering in the rear. These little cars may be parked in their own length and are economical to run.

jor faults, many of them inherited from horse drawn vehicle days, still intact.

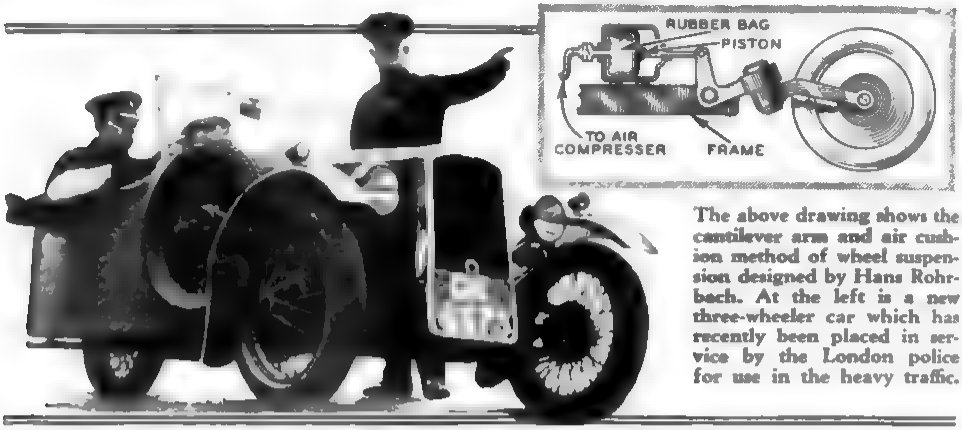
I have a little car of my own design which was employing front wheel drive before that process was made famous on the race tracks of the United States. But my car has none of the difficult problems involved in transmitting power through flexible connections to the steerable front wheels. For my front wheels do not turn. They are fixed, and for steering I have a single wheel in the rear.

My car has a six cylinder air-cooled engine placed crosswise of the body, exposing each cylinder to equal amounts of cooling air. Instead of an axle and springs the front wheels are carried on long cantilever arms. If one wheel hits a rut or climbs an obstruction it is free to do so without twisting the body or affecting the other wheel, since there is no connecting axle. Because there is no distortion no heavy frame is needed.

I have another car of my invention, which may soon be on the market, in which a pair of small three cylinder engines are built directly into the axle ends, partly within the front wheels, eliminating the space occupied by the motor in the average car body, and eliminating the differential and all connecting shafts and gearing. The clutch, of the dry plate type, and the gears for speed shifting are actually within the wheel, and the tiny motor occupies hardly more space than an ordinary brake housing would on the outside.

Big motor buses, trucks and many pleasure cars in Germany are already equipped with my air springs, instead of the conventional steel spring, which must be supplemented by some form of shock absorber to correct its faults. The air spring is simply a suitably shaped reservoir and piston, in other words just a larger edition of an air or hydraulic shock absorber. It has the advantage that the pressure can be corrected to fit the needs

The New Light Car Can Move Sidewise Into a Limited Parking Space



The above drawing shows the cantilever arm and air cushion method of wheel suspension designed by Hans Rohrbach. At the left is a new three-wheeler car which has recently been placed in service by the London police for use in the heavy traffic.

These three-wheeler cars will be able to park in their own length as shown above. You may drive the front of your car into the limited space, turn the rear wheel at right angles, and roll to the curb.

of the load. When a bus or truck is lightly loaded the driver regulates the air pressure within the chamber to absorb the shocks. As the load is increased more air is forced in, and at all times the spring reaction is kept at a normal degree. It also can be adjusted to fit various types of roads, with their various degrees of shocks.

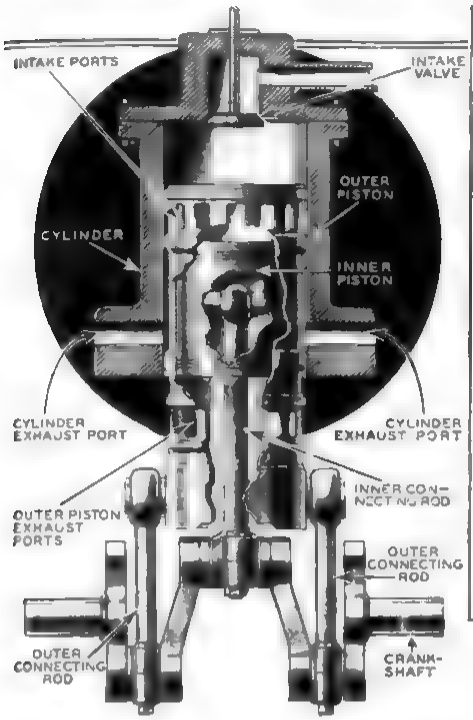
But it is in engines that I see the greatest need for revolution and improvement. The simplest study of thermo-dynamics teaches that the efficiency of any heat engine depends on the amount of heat generated which is actually converted into power. Yet in the familiar gasoline engine we actually have to use cooling water or air to dispose of heat which we are not using as power.

Obviously something is radically wrong in such a state of affairs. Several years ago I began a study of the problem of placing thermo-couples, or electric thermometers, in the cylinder head of an experimental engine and measuring the temperature at all points. Then it occurred to me to add measuring devices of the other side to measure the piston temperature. And I discovered, contrary to general belief, that the piston was relatively cool and that the faster the engine ran the cooler it became!

I knew all the theories about heat induction into the piston, but practical experience showed they were wrong. A motor piston rests on the cylinder with the aid of two or three piston rings of fairly small cross-section, and these are further insulated against heat transmission by a film of oil, and, if the old theories were right, the heat transmitted to the piston by the explosions would be bottled up there and could not escape, and the piston must soon melt. Yet practical experience shows that piston troubles are only serious when climbing steep hills in high gear, which means slow piston speed, or under similar conditions.

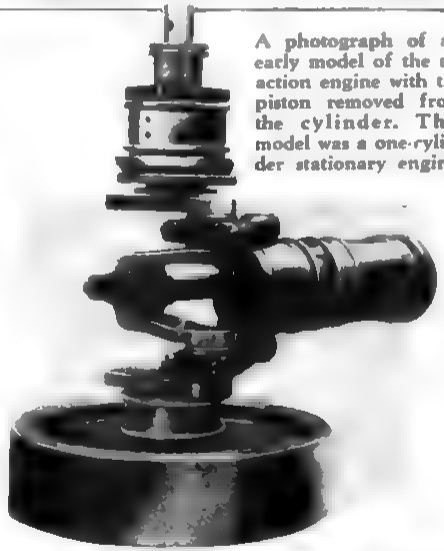
It was that study that led to my invention of the Rohrbach reaction motor, and finally the development of a Diesel engine of the reaction type. In the reaction motor so much more heat is used to produce power that cooling becomes unnecessary.

What I did was to build an engine with two pistons, one inside the other, traveling in opposite directions under the impulse of an explosion taking place between the two



A phantom drawing of the Rohrbach reaction engine, showing how the pistons will operate in opposite directions on the one explosion.

A photograph of an early model of the reaction engine with the piston removed from the cylinder. This model was a one-cylinder stationary engine.



Another view of the reaction engine, showing the unusual crankshaft and piston arrangement.

—between inner piston and under side of the top of the outer one. Having decided that a piston keeps cool because it is moving, and the faster it moves the cooler it keeps, I provided an explosion chamber in which all parts were moving.

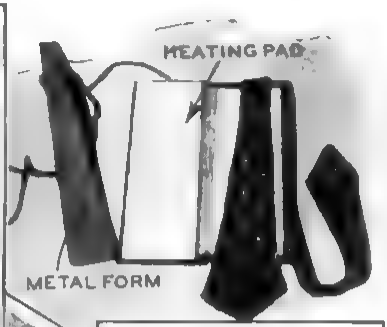
Imagine a piston moving in a cylinder, the open end of which is shut off by placing the entire earth on it. Compared to the piston which is in the cylinder the mass of the earth is practically infinite. Now if we imagine such a cylinder to be charged with a combustion mixture the pressure of the explosion when the charge is ignited, will produce a certain effect on both the piston and the earth. As power is the product of mass multiplied by speeding impulse, the piston power conforms to that basic law.

But on the other side the same law must be operative. The mass there, being the earth, is, however, infinite, so the impulse is zero, since the explosion can not move the mass. And so the power there cannot be converted into motion and must be consumed as heat. That, in as non-technical terms as it is possible to explain it, is why the immovable cylinder and cylinder head of the ordinary engine gets hot, while the moving piston remains relatively cold. Action and

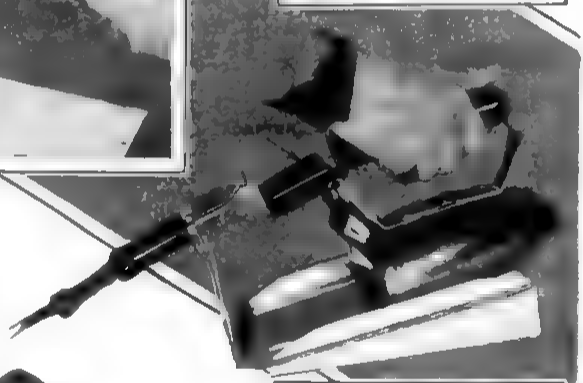
(Continued on page 206)

TEN INVENTIONS *that*

One of the leading electrical refrigerator companies has recently developed a rubber ice cube tray in which the water is self leveling. Heretofore the trays used for this purpose have had to be leveled separately.

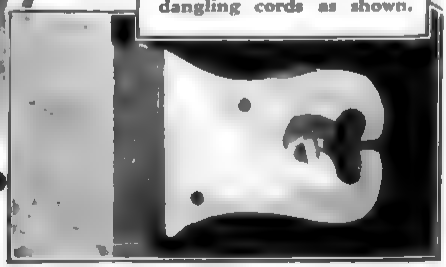


An electric tie presser for home use is designed to operate from any light socket. The metal form is inserted into the tie, as shown above, and then the device is closed for a few minutes.



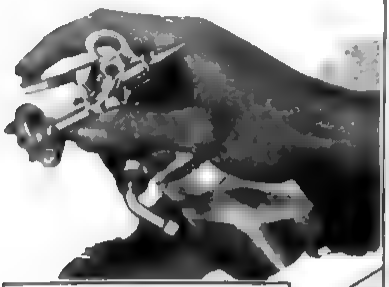
This iron stand makes your electric iron cordless. The adapter can be adjusted to any iron and the terminals may be raised or lowered. The device eliminates any dangling cords as shown.

This attractive, modernistic extractor gives you the pure juice without pulp or seeds.



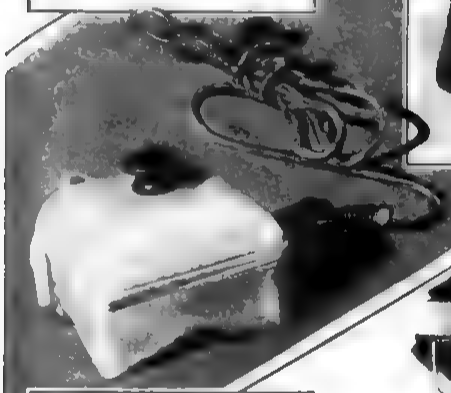
A reversible open jaw curtain bracket for spring rollers which does away with cotter pins.

Make Housekeeping Easy

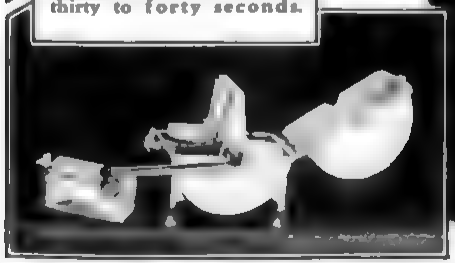


Here is a spray gun, operated by a vacuum cleaner, for spreading moth preventive on furniture and clothing. The liquid is good for five years unless articles are washed in soap and water.

A very useful chair for keepin the trousers pressed. It is heated electrically from a light socket.



The toaster shown above produces no crumbs and cannot be tipped over. It will toast bread of any thickness on both sides in thirty to forty seconds.



This ingenious machine mixes color into oleomargarine, beats eggs and fudge and mashes potatoes, besides having a dozen other uses.

This handy bathroom rack is made of metal and can be adjusted to fit into any medicine cabinet

Hood Over Locomotive Smokestack Keeps City Air Clean

The hood fitted over this locomotive smokestack subjects the thick black smoke to a cleaning process which removes dirt.

ONE of the mechanical devices used to keep the city of Chicago clean is the smoke-cleaner for locomotives, shown at the left. When an engine, belching black smoke, arrives in the Chicago yards, the specially constructed hood is put in place in the stack opening and the smoke passes through a pipe, where it is cleaned of its soot and other grime-producing elements before it is permitted to pass out into the open air. As a result, housewives in the vicinity don't have to clean their curtains so often. The photo was taken in the yards of the Pennsylvania railroad at its Chicago terminal.

No More Shaving for Men!

GERMAN chemical inventiveness has produced a cool, snow-like substance which, when applied to the face like cold cream, dissolves the stiffest beard in a couple of minutes and enables the unwanted whiskers to be rinsed away with a wash cloth. It is said to be especially kind to tender skins, eliminating the irritation of shaving.

Call Indicator for Telephone

The finger points to the indicator which automatically records the number called.

THE numbers dialed on automatic telephones can now be recorded on a call indicator device invented by William Greenberg of Portland, Ore. In the center of the regular telephone dial is a space where the numbers being dialed are reproduced, showing what number is being called, and warning immediately of any error. Pressing a small button at the top of the device clears the figures for the next call.

Town Pump Operates Fountain

A modern drinking fountain and the old town pump are hooked together in this thirst station.

YE OLDE Towne Pump is made to operate a sanitary drinking fountain in the public park of Lake City, Mich. A pipe leads from the pump to the fountain, and when the handle is pumped an even flow of water gushes forth. Closing a valve in the piping system diverts the flow from the fountain to a faucet where a pail of water can be drawn. The arrangement is inexpensive and could be advantageously duplicated by many tourist parks.

Novel Portland, Ore., Fire Station Looks Like a Residence

The fire truck of this unique fire station, located in an exclusive residential district in Portland, Ore., is housed in a garage which forms a part of the building. Firemen pass idle hours in the adjoining rooms of the house.

With the garage door closed, as shown above, the station has the appearance of other beautiful homes in the neighborhood.

ONE of the most attractive fire stations in the country —so attractive, in fact, that it is indistinguishable from the beautiful homes of the neighborhood —is located in an exclusive residential district in Portland, Oregon. The residents of the neighborhood, threatened with increased insurance rates, and not wanting the charm of the district marred by the presence of an unsightly fire station, got together with the fire chief and an architect, and this fire station, shown in the accompanying photos, was the solution of the problem.

The fire truck is housed in a garage that forms a part of the building, which has the door and driveway so arranged that the truck can make as quick a get-away as in a regular station. When the garage door is closed the station, being built according to the restricted building code, looks no different from an ordinary home, except for the scroll bearing the words: "Engine 18."

Train Rail Clicks Disturb Radio

ENGINEERS installing radio receivers on French railway trains for the use of passengers have encountered an unexpected difficulty due to annoying interference between the rhythm of music coming over the radio and the different rhythm of the wheels of the train clicking on the rails. While the rail rhythm is not unpleasant if heard alone, and while the rhythm of the music is distinctly pleasant to most people, the two rhythms usually fail to coincide, often with most unpleasant effects on the travelers who subscribe for the radio service.

Above and on the opposite page are shown the fighting planes of the countries which are competing for mastery of the air. All nations attempt to keep the performance of their fighting planes secret; therefore the speeds given are approximate, according to latest information available. Hawker "Hornet" is fastest of above.

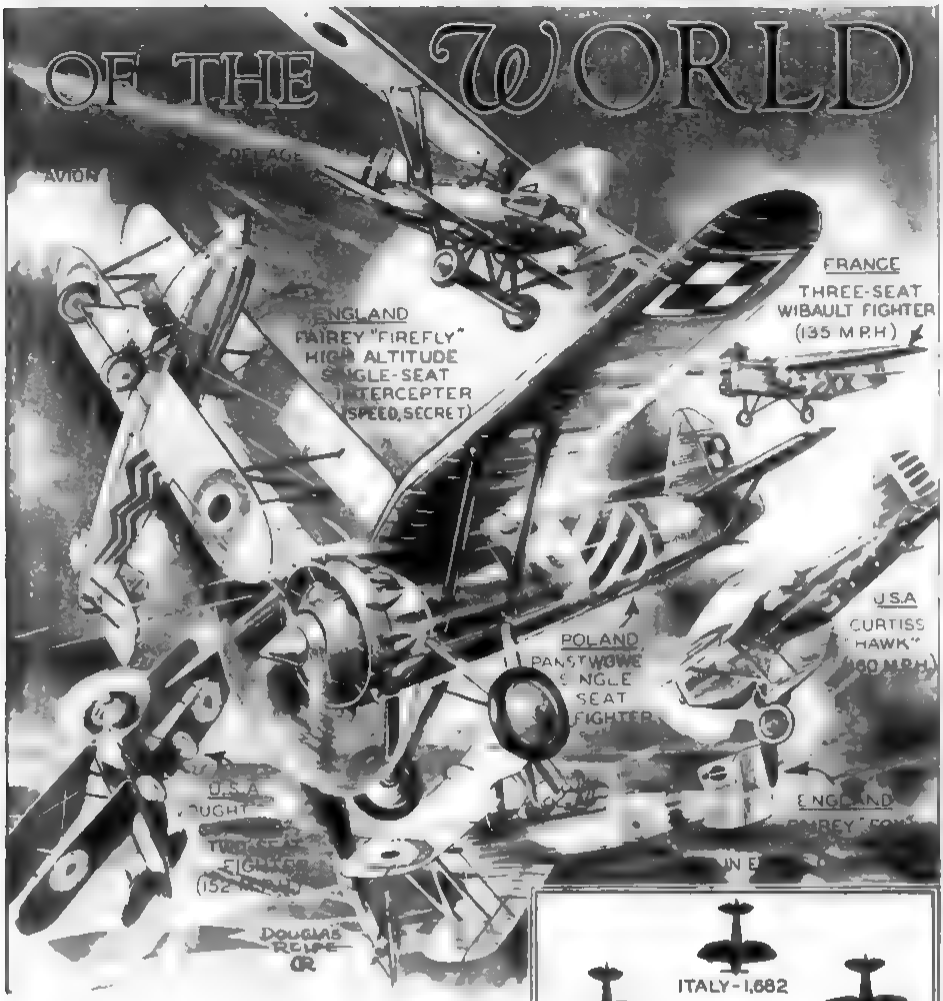
by H. H. ARNOLD

Experts agree that the next war will be decided in the air. How, then, are the great powers prepared for such a war? H. H. Arnold, who has been actively engaged in military aviation for twenty years, this month compares the world's fighting forces.

IT IS always hard to get reliable figures concerning the actual numbers and performances of the military planes of the different countries. Accordingly any figures given will probably be more or less out of date. However as all of the data will be about the same amount behind the times, an idea as to the comparative aerial strength of the various countries can be obtained. Accordingly the figures given herewith should not be taken as being absolutely correct for the aerial forces as of 1931.

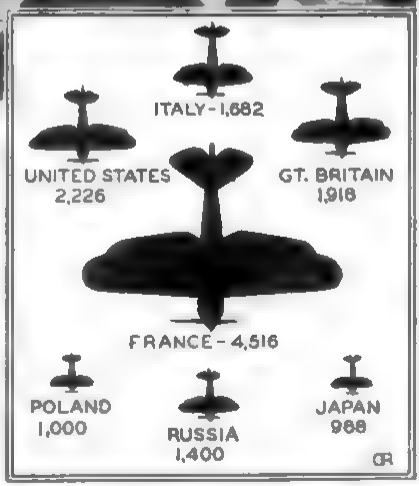
For years France has been nervous concerning her national security. She has always had a strong army and since the World war, has built up a very strong Air Force. As a matter of fact the French have more military planes than the United States and Great Britain combined. With France leading with 4516 airplanes, the United States is a poor second with 2226 planes. The United States' figures include Army, Navy, National Guard and Marine airplanes.

During the periods immediately following the World war the French concentrated on getting great numbers of planes. The British

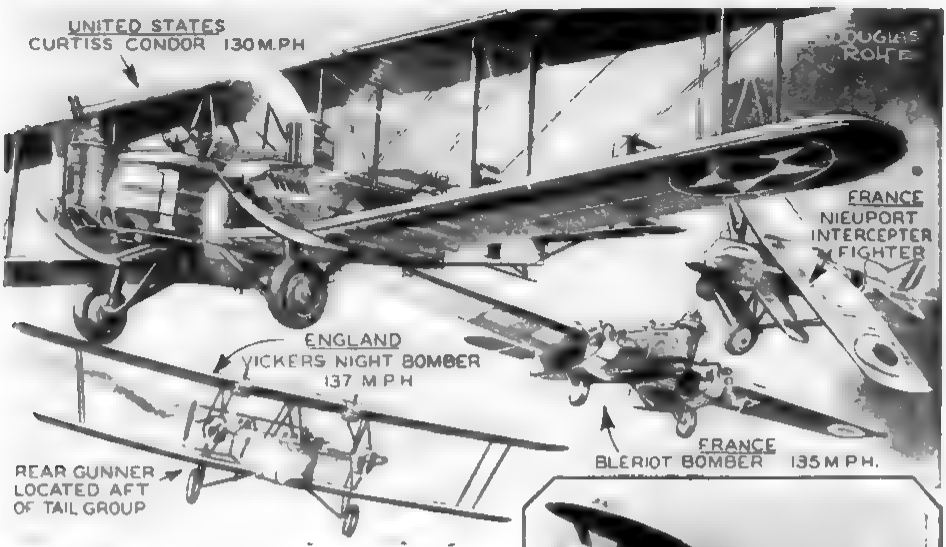


The Polish "Panstwowe" fighter, seen in the center of the above panel, is said to have the highest performance of any fighting plane known. The exact figures are being kept secret by the Polish government. The Fairey "Fox" bomber disrupted British air maneuvers by outflying the fastest pursuit planes.

during the same period built only enough planes to carry on with. They figured that the next war could not come along for ten or more years and concentrated on permanent structures, development of new types of planes and engines and building up of airdromes where they would play important parts in national defense. During recent years the British have been bringing out airplanes with far better performances than those of any other country, though numerically inferior to France and the United States.



How the nations compare in aerial fighting strength. France has the greatest number of planes, but has fallen behind in performance. Great Britain has most efficient planes.



Typical bombers of the three leading countries, and a French intercepter which does not have the performance of British ships of this type. The Curtiss "Condor" bombers of the United States can carry the heaviest loads the longest distances.

350 miles an hour was recently attained in a power dive by the new Boeing fighter above.

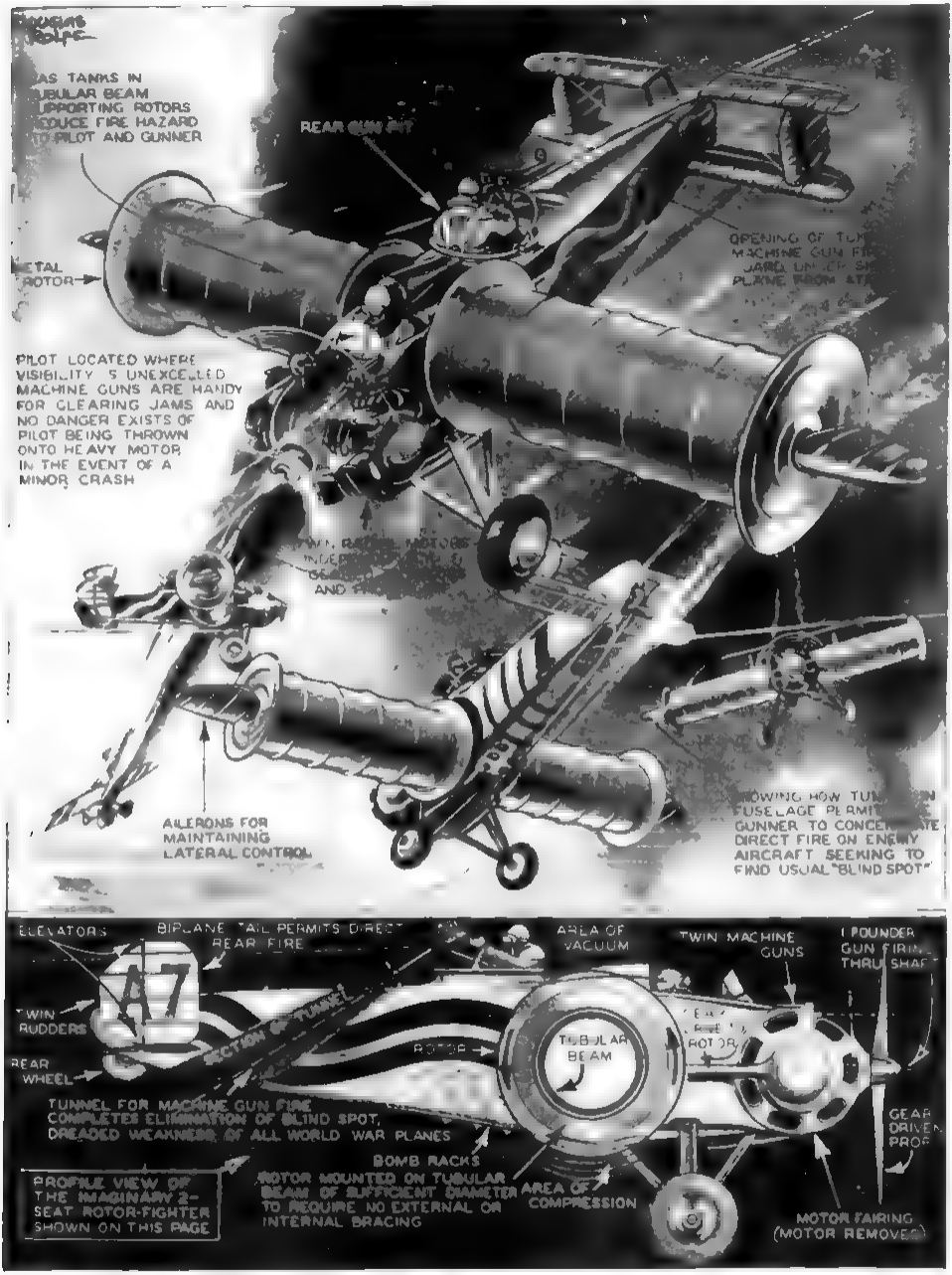
It is but recently that the Italians have taken up aviation with much constructive vigor. They are gradually building up a strong airforce with planes having good performance. The recent flights across the South Atlantic show the improvement of military types. In numbers the Italians are fourth but they have greatly increased their production. Our five year program has made it possible for the United States to stand second in point of numbers. In performance we rank second also.

In bombing planes the United States, France and Poland, all have provisions for carrying a 4000 pound bomb. The Italians provide for a 2000 pound one and the British light bombers for but an 800 pound bomb. Thus the British light bombers can carry just about one fifth the bomb load that can be carried by our Condors.

Each country seems to be influenced in its aircraft development by its national characteristics, geographical location, or topographical situation. France, surrounded by prospective enemies, has a large air force which it always keeps up in numbers. England, surrounded by water, has built up a highly efficient aviation outfit. However, in order to take care of its many outposts in the colonies, it has built up large cargo planes capable of carrying heavy loads, long distances. Italy has spent much time on water planes. Poland had support from the French in building up its air units and accordingly uses many French planes. The Japanese are completely isolated and do not seem to have taken much advantage of designs from other nations. Their planes seem to have lines all their own. In the United States we have long distances to cover in going from one place to another. Accordingly we have planes with large gas tanks and at the same time planes which give performances well above average.

It should be noted that when any one of the nations find out a new wrinkle or create a new design which gives better performance, it does not take the others long to find it out. Accordingly there will never be much difference between the climb, speed, or cruising range of the planes of the same type.

Bullet-Proof All-Metal Rotor Airplanes Being Developed for Future Wars



A few months ago this magazine announced the successful test flights of the first rotor airplane. Several nations are now experimenting with this type of plane for military purposes, and the world may soon see the all-metal rotor-fighter such as is illustrated here. Artist Douglas Rolfe, an expert on aircraft design, shows you how the details of construction of these fighters will probably be worked out.

Children's Music Lessons Become Play With New System

Miss Camille Allensworth, of Washington, instructing a class of children with her new system of combining learning with play.

MISS Camille Allensworth, Washington music teacher, has introduced a new system of teaching music to children which combines learning with play. Checker-like music notes and symbols are placed on the proper lines of the large musical staff and are given funny names, such as Tumble-down D, Easy E, Fatty F, and Grandfather G, appealing to the imaginations of the children and making it easy for them to remember the notes.

The system seems to have worked a miracle, for instead of the bored kiddies trying to dodge the music lesson, they now look forward to it eagerly.

Navy Acquires Folding Sub Plane

SECRET tests have recently been conducted at a New York airport on an amphibion monoplane which is so small that it can be folded up and carried in an eight-foot tube in a submarine. The wasp-like craft was flown by Grover Loening of the Loening Laboratories, New York, where the ship was constructed.

The craft has a wing spread of 38 feet and is powered with a 110-horsepower Warner-Scarab engine. It is reported to have a cruising speed of 100 miles an hour. It can be assembled and dismantled in three minutes, making it ideal for submarine use, greatly adding to the effectiveness of that weapon.

Practical Sun Motor Predicted

DR. BRUNO LANGE, the young German physicist who recently invented a new kind of photo-electric cell composed of a layer of single molecules of copper oxide spread over the surface of a plate of metallic copper, has applied his invention to the construction of a sun engine said to be powerful enough to operate a small electric motor.

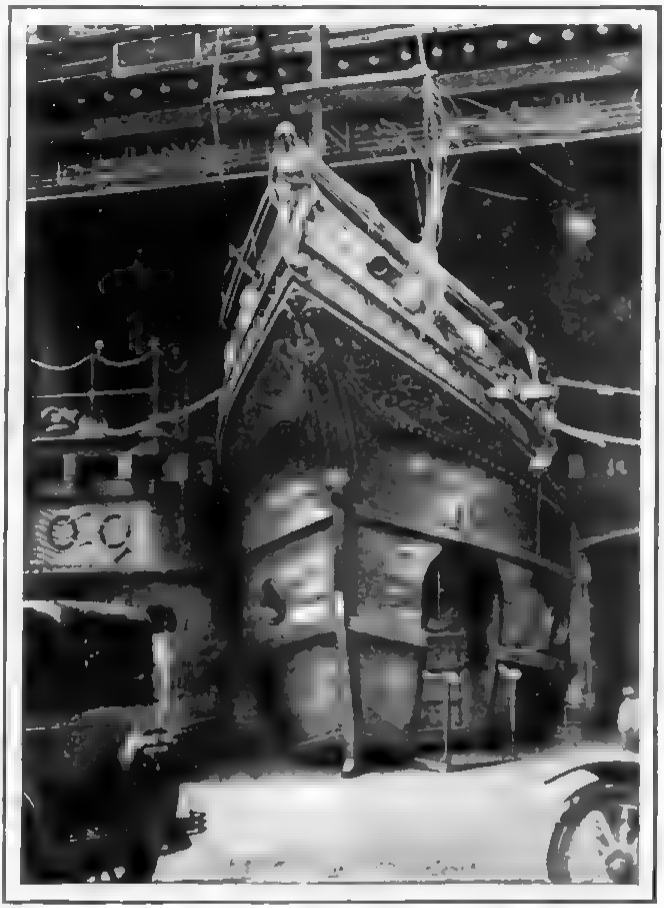
The energy received in sunlight has been computed by Professor Henry Norris Russell as equalling more than four million horsepower on each square mile of sunlit surface. Ordinary photo-electric cells convert an extremely small part of this energy or of any kind of light energy into electricity.

A side view of the new Loening amphibian monoplane which was recently tested by the U. S. Navy with the view to its adoption for use with the submarine flotilla. It can be stowed aboard a sub in 3 minutes.

Restaurant Entrance Like Bow of Ship Attracts Business

IF a first prize were awarded for unique entrances, it would probably go to the proprietor of the Bernstein's sea food restaurant in San Francisco. The entrance to the restaurant, shown in the photo at the right, leaves passers-by in little doubt as to the particular kind of food served there. It must, they reason, come from the sea, and on going in to investigate, they find their guess correct.

The entrance is built in the form of the bow of the ship "Nina," on which, as every schoolboy knows, Columbus sailed on his great voyage of discovery. The model is complete, even to figurehead portholes.

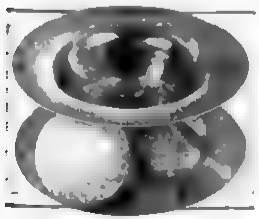


Shaped like the bow of the "Nina," flagship of Columbus' fleet, this unique San Francisco restaurant entrance attracts much attention.

New Golf Trap for Indoor Practice

A NEW putting trap for indoor golf recently placed on the market eliminates the necessity of using improvised holes. Consisting of two disks held in a parallel position by means of a slight spring tension, the trap will catch and hold any ball which would be holed in a regular putting green.

Should the ball be struck too hard the trap will reject it, but on the other hand, a ball which would barely reach the cup and drop into it will be held securely by this trap. The ball is released by pressing down on the upper disk opposite the place where the ball is caught. The device provides conditions for golfers similar to those encountered in actual play on the golf course putting greens.



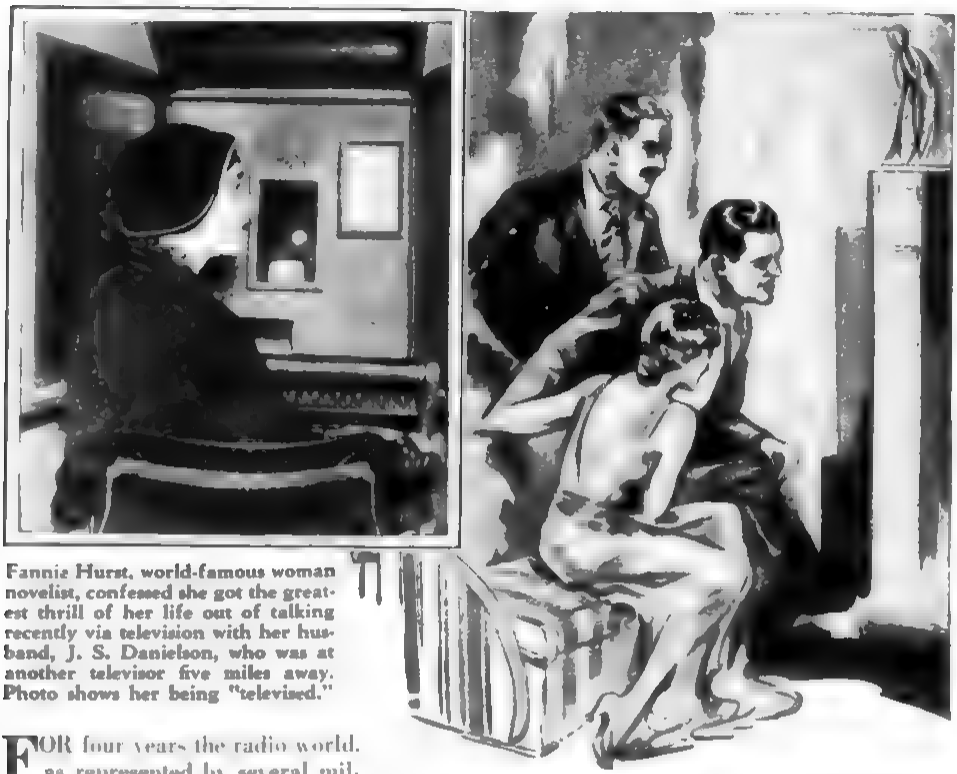
This new indoor golf trap catches ball between disks.

Steel Wire Cuts Marble Blocks

USING a one-quarter-inch three-ply india strand plow steel wire, a marble concern in Izard County, Arkansas, on the White river, is literally slicing a mountain of marble into commercial size blocks.

The wire works on an endless belt like a hand saw, moving at high speed in one direction, utilizing the cutting principle used on the regular stone gang saws, the cutting friction being supplied with sand. The wire works down from the top of the block, the cutting progressing on a twenty-foot block at a rate of about six inches an hour. The power plant which drives the cable is a 10-horsepower gasoline engine.

What's Keeping Television



Fannie Hurst, world-famous woman novelist, confessed she got the greatest thrill of her life out of talking recently via television with her husband, J. S. Danielson, who was at another televisor five miles away. Photo shows her being "televised."

FOR four years the radio world, as represented by several million American homes, has been waiting for television. With a number of stations now transmitting radio television programs on schedule, together with a decided indication of real showmanship about to replace haywire experimentation, the average household is waiting in readiness to consider radiovision as something more than a passing news item. But what equipment is necessary? What stations are broadcasting? Most of all, what is delaying the ultimate popularity of television? Such questions are becoming commonplace.

For nearly two years now a few broadcast stations have been giving picture programs on regular schedules. At the turn of the year there were no less than nineteen television transmitters in more or less regular operation, with outputs ranging from 100 to 20,000 watts. But at the same date, according to the best estimate of television manufacturers in a position to know, not more than 10,000 American homes were equipped with television receivers.

I have just returned from a 2,000-mile trip, visiting all the principal television laboratories and factories in the east, to find out, in the interest of MODERN MECHANICS AND INVENTIONS readers, what they have to offer.

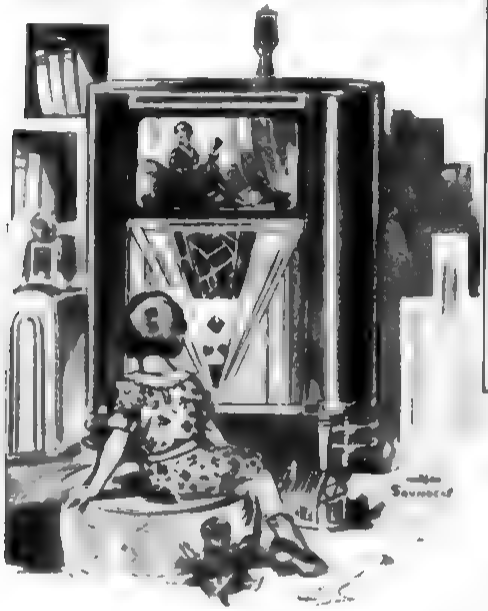
I saw several demonstrations of radio transmitted pictures better than anything that had been dreamed of a year ago. I saw a simple radiovisor kit which solves the old problem of keeping the receiver synchronized and in step with the transmitter, and makes possible well nigh perfect reception of pictures from a station at any reasonable distance. And, over a land wire circuit, I talked with a man several miles away and saw him face to face as we chatted—a marvelous demonstration of two-way television, for he saw me as clearly at the same time.

I saw compact, well developed apparatus,

Out of Your Home?

by J. EARLE MILLER

Why hasn't television achieved popularity as a means of home entertainment? Here's an authoritative article on television's present status that outlines the reasons for delay in public acceptance.



The new Jenkins radiovision set, designed specially for home use. Tuning and adjusting image, which appears on screen at top, is done with knobs below, as demonstrated.

not much larger than a movie camera, with which out-of-door scenes can be picked up and transmitted, using only natural sunlight to "see" the image. I saw a new system of television reception which has no scanning disc or motor, and no mechanical moving parts. And I was shown letters from nearly every section of the country reporting good reception of broadcast pictures on receivers built from kits ranging in price from $7.50 up to $42.50, and on manufactured sets selling at around $100 to $150 or $175.

That's the picture of what is actually being done.

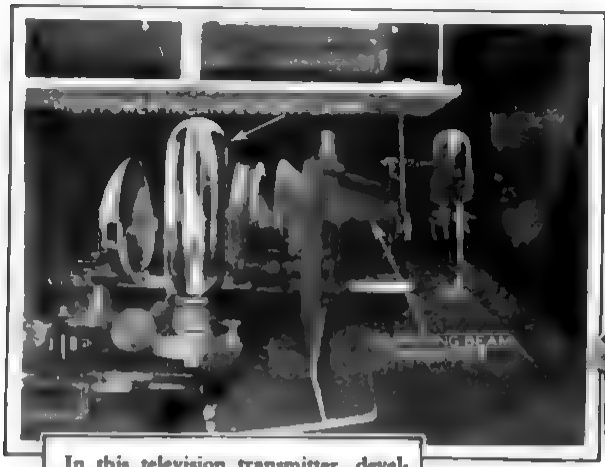
On the other hand the "big three" of the electrical world—General Electric, Westinghouse and A. T. & T.—as represented by their radio entertainment division, R. C. A.-Victor, say that television is not yet ready to be placed in the public's hands, and that view apparently is also held by the Radio Commission at Washington.

And there lies the real reason why the country is not studded with television transmitting stations, and why television receivers are not found, perhaps, in millions of homes. For the government continues to class it as an experiment and will not permit the broadcasters to sell time for advertising purposes, as they do on their speech broadcasting stations. And without some form of revenue only a few stations have been willing to invest in short wave transmitters and all the other apparatus needed for television, and undertake to develop suitable programs for visual entertainment.

Some of the independents in the field claim the "big three" group not only is withholding its own television developments from the market, but is exerting various forms of pressure on broadcasters to keep them from installing systems which are being marketed.

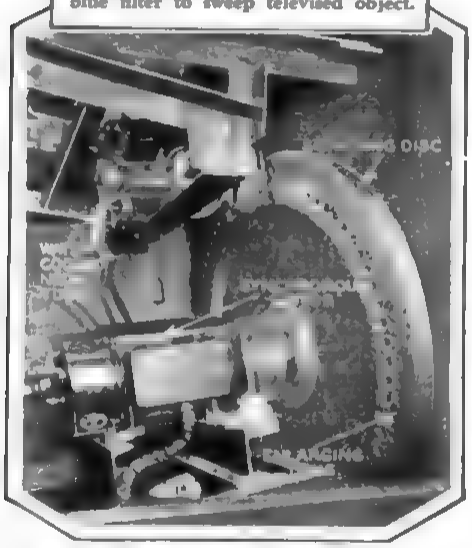
Regardless of whether such pressure exists, there is no doubt that capital to extend television transmission will not become available in any large sums until the government radio commission removes the ban on commercial television programs and allows

New Television Equipment Eliminates Bright Lights, Harmful to Eyes



In this television transmitter, developed by Bell Laboratories, the lamp throws a powerful beam through the blue filter to sweep televised object.

This simple home radiovision set, produced by Jenkins laboratories, comes in kit form, and has automatic synchronizer to keep images in step.



Clearer and larger television images are now produced with lower current by means of this new neon tube and scanning disc, both of which are equipped with lens to magnify light fluctuations.

the new art to be put on a money making basis. The present ban not only affects the extension of television facilities, but handicaps the broadcast of programs over such facilities as are available.

The 1,000 watt experimental television transmitter operated by the Chicago *Daily News* station, WMAQ, in connection with its speech broadcast on the higher wave band, is a case in point. President Hedges, of WMAQ, would like to develop programs employing dramatic talent, with paid actors in suitable costume plays, and other new types of visual entertainment. But until the time on the air can be sold to advertisers the money is not available to pay entertainers, buy costumes, and stage spectacles which might rival moving picture entertainment.

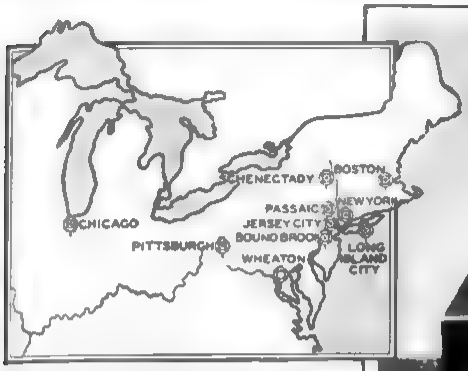
The *Daily News* broadcasting officials are enthusiastic over the results already attained with the 1,000 watt station, which operates on a 45 line scanning system, using three spiral rows on the scanning disc. They believe it is far superior to the more common forty-eight, single row system, for it eliminates flicker. Letters have been received from points as distant as Cincinnati, Oklahoma City, St. Louis, and Albuquerque, N. M., reporting excellent reception of the short wave pictures with the accompaning voice on the normal broadcast band.

So much for the situation of television today. If you want to get into this most fascinating form of home entertainment, here is what you will find:

You can buy a manufactured picture receiver and a manufactured short wave receiver, specially designed for its purpose, or buy any of several different kits, for either picture receiver or short wave radio set.

To pick up the existing nineteen transmitting stations you need a short wave radio set covering the wave band from 2,000 kilocycles up to 2,950 kilocycles, or from about

Nineteen Radiovision Stations in U. S. Are Now Broadcasting Programs



Above map shows location of principal radiovision broadcast stations. A list of stations, with call letters and wavelengths, is given below.

This photo shows the usual studio method of transmitting images by radio. Subject is scanned by beam from arc lamp concealed in cabinet.

Location	Call	Meters	Kilocycles
Boston, Mass.	W1XAV	105-102	2850-2950
New York, N. Y.	W2XBS	143-136	2100-2203
Schenectady, N. Y.	W2XCW	143-136	2100-2200
Long Island City, N. Y.	W2XR	105-102	2850-2950
Passaic, N. J.	W2XCD	150-143	2000-2100
Jersey City, N. J.	W2XCR	150-143	2000-2100
Bound Brook, N. J.	W3XAK	143-136	2100-2200
Camden, N. J.	W3XAD	143-136	2100-2200
Wheaton, Md.	W3XK	150-143	2000-2200
Pittsburgh, Pa.	W8XAV	143-136	2100-2200
Chicago, Ill.	W9XAC	150-143	2000-2100
Chicago, Ill.	W9XAP	143-136	2100-2200
Chicago, Ill.	W9XR	105-102	2850-2950

100 meters to 150 meters. In the 2,000-2,100 band (television so far is operating on hundred cycle bands instead of the ten cycle range between the longer wave speech broadcasting stations) you will find six stations, three of 5,000 watts power, and one each of 500, 250 and 100 watts. The three 5,000 watt stations are located at Wheaton, Md., New York City and Passaic, N. J., the first being operated by C. Francis Jenkins Laboratories and the other two by the Jenkins Television Corporation and DeForest Radio Company, which are closely related and are using many of the Jenkins patents.

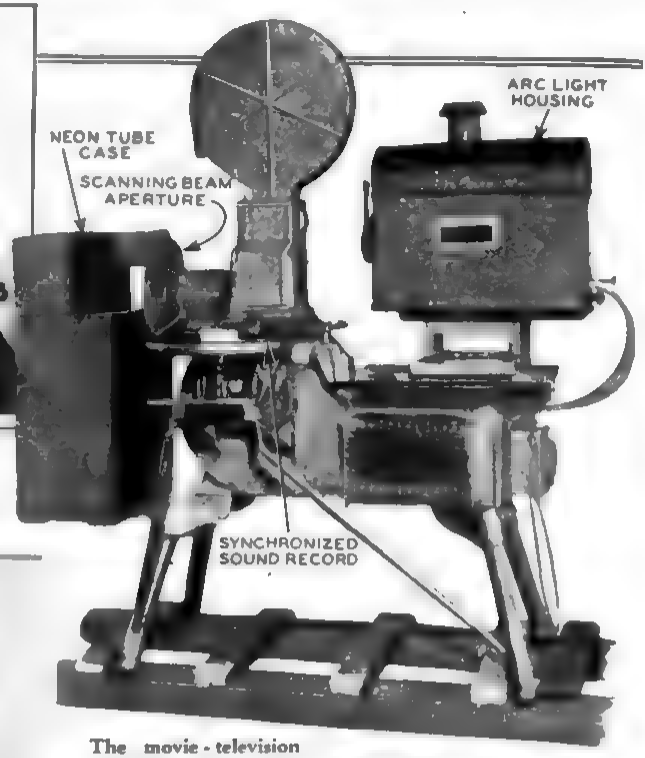
In the next band, 2,100-2,200 kilocycles, there are seven stations, including the 20,000 watt transmitters of the Westinghouse and General Electric companies, two 5,000 watt stations of the National Broadcasting company, the 1,000 watt Chicago *Daily News* Station and the 500 watt transmitters of the RCA-Victor group and Radio Pictures, Inc.

The two shorter wave channels available for television by Federal order lie between 2,750 and 2,850 kilocycles, and 2,850-2,950. In the former there are three experimental stations operating at no stated intervals, and in the latter band three, of which two, with 500 watt power, operate on set schedules; and the third, a 5,000 watt plant near Chicago, has no regular hours.

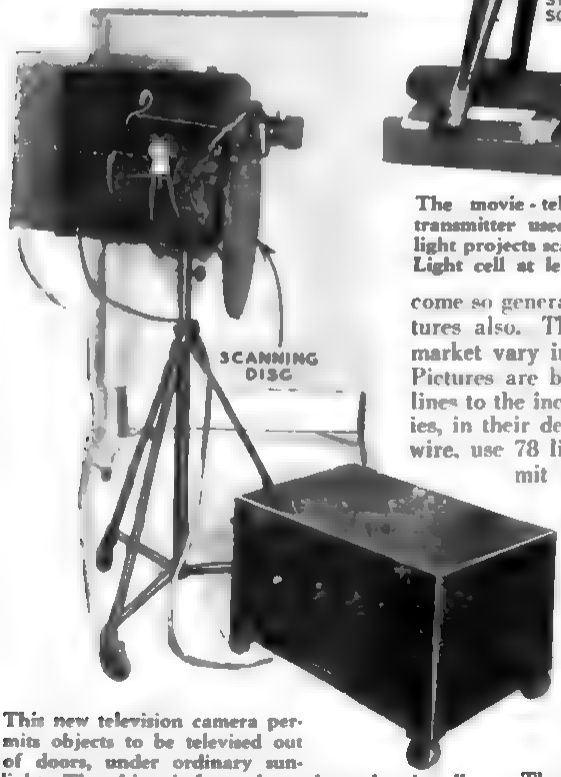
Here is another type of transmitter used in televising features of actor. The scanning beam is projected through center hole, while photo-electric cells, above, below and at side, pick up image.

That covers the radio broadcast end of television. To transmute images into electrical energy which can be transmitted through the air or over wires engineers use an instrument variously described as a televisor or a radiovisor. The former term really should only apply to pictures sent by wire, but television has be-

Developed at Westinghouse laboratories, the new cathode ray television tube shown here eliminates customary scanning discs.



The movie-television transmitter used to broadcast motion pictures. The arc light projects scanning beam through film in center section. Light cell at left picks up image through scanning disc.



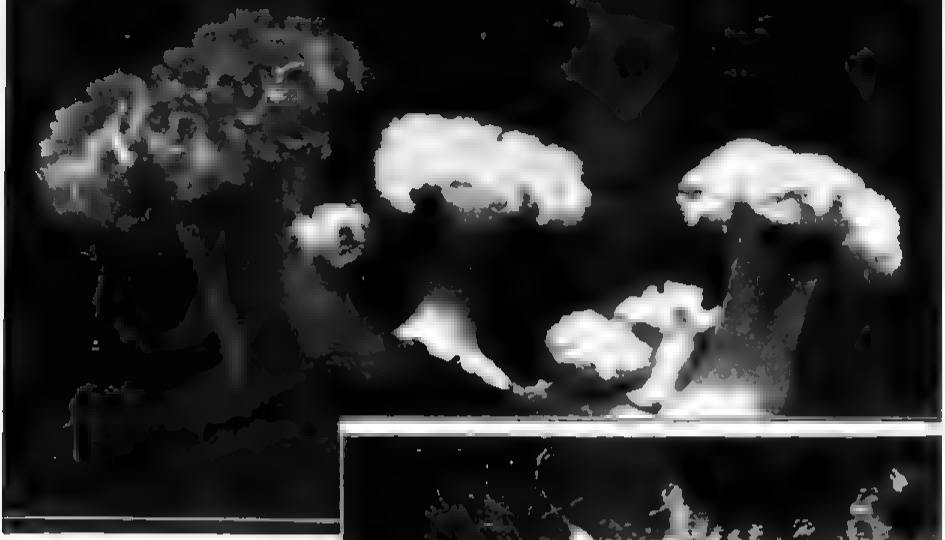
This new television camera permits objects to be televised out of doors, under ordinary sunlight. The object is focused on photo-electric cell with a special lens, and the enclosed scanning disc acts as a shutter to expose the cell to only one line at a time. No strong arc lights are required for making a clear picture.

come so generally used that it is applied to radio pictures also. The picture reproducers so far on the market vary in type but are the same in principle. Pictures are being broadcast with 24, 45, 48 or 60 lines to the inch, while the Bell Telephone laboratories, in their demonstrations of two-way television by wire, use 78 lines. Various broadcasters also transmit varying numbers of pictures per second, the more common numbers being fifteen and eighteen.

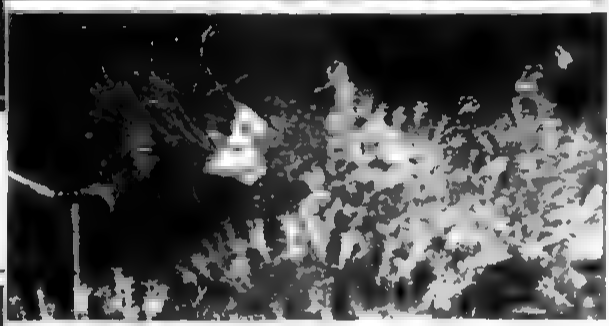
The receivers all use a neon glow lamp to take the output of the short wave receiver, a scanning arrangement consisting either of a disc or a drum with holes through which the light beams pass, and an enlarging lens to increase the apparent size of the image and make it possible for several people to see it at one time. The biggest problem is turning the disc at the exact speed of the scanning disc at the transmitting end, and keeping the two

(Continued on page 198)

FLOWERS from the SEA



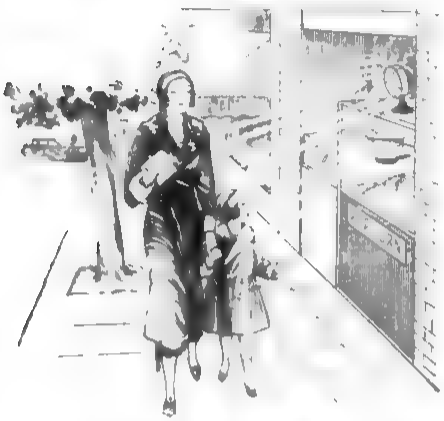
The Plumose Sea-anemone, most beautiful plant of the sea bottom, which grows in white, grey, and pink. Right—Tube building worms, polyps, and sea mats discovered in a shell. The balloon-like plants shown at right are baby jellyfish.



Left—Two specimens of the Sea Dahlia. The petals are gorgeously colored, but woe to the tiny animal attracted to these by their beauty. Below—Teeming animal life and colorful plants of ocean floor, magnified 15,000 times.

HANDIKINKS

Handikinks department is devoted to presenting you with schemes and ideas for doing difficult, laborious tasks in an easy, labor-saving manner. No expensive layout of tools and materials is required. In most cases, just a few old discarded parts and several ordinary tools are all that are required for the job.

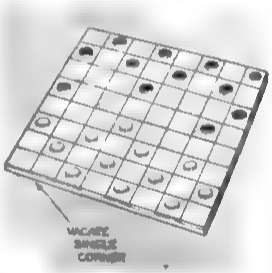


Electric Fan Helps Popcorn Sale

ADVERTISING men hold that if you want to increase the sale of your goods you should let people know that you have something to sell. If you are selling popcorn, you will find this little advertising scheme will bring in customers that would otherwise pass you by. Simply set an electric fan on your stand and direct the breeze towards the sidewalk as illustrated in the drawing at the left. The aroma of popcorn, rising from popper, will then be blown to passers-by who, attracted by the delicious odor, are much more likely to buy from you than if you merely displayed your wares in the usual manner. The vender who originated this stunt increased his business 40%.—John E. Hogg.

Simple Checker Move That Will Help You Win

HERE'S a tip that may help you best an opponent at a critical point in a checker game. Instead of moving your men into the corners at the beginning of a game, move out of the single corner as shown in the accompanying drawing. Your opponent will then very likely run into the corners, and this will give you a stronger position.—W. L. Roper.

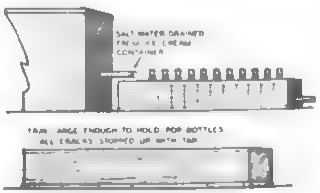


Roller Straight Edge for Sign Painting

THE painting of street and sidewalk signs to control autos and pedestrians can be performed in a neater and easier manner by using a simple roller type straight edge such as shown in the drawing at the left. This tool is simply a true wooden cylinder about five feet long and four inches in diameter, around the ends of which are wrapped two rubber sleeves made from old automobile inner tubes. The roller is rolled across the street and parallel lines are drawn at measured points to form the letters as illustrated.—C. A. Luers.

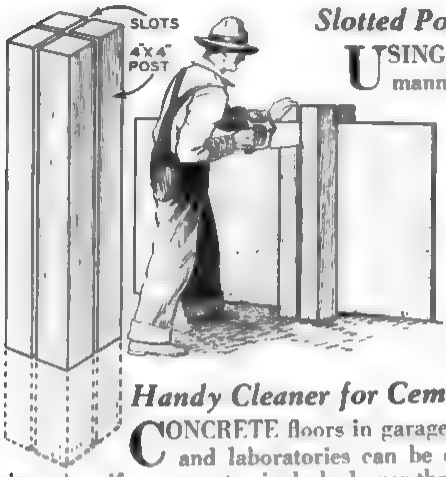
Economical Tray to Keep Soda Water Ice Cold

SODA water or other beverages may be kept ice cold very economically by placing them in a tray filled with water drained from the ice cream container commonly used in groceries or small confectioneries. A drain hole is first made in the freezer and a pipe inserted, as shown, leading to the wooden tray.—Theo. Allen.



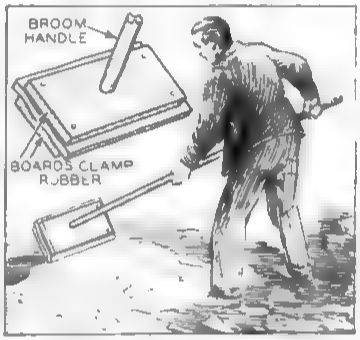
Helpful handyman stunts

Slotted Post Makes Saw Guide to Cut Wall Board



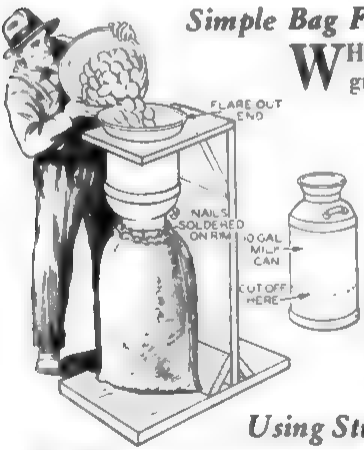
USING a saw to cut Compo or wall board in the ordinary manner usually results in a crooked cut or a ragged, rough edge on the opposite side of the board. A neater job will result if you erect a 4x4 post in a concrete base and slot it with a hand saw as illustrated in the drawing at the left. The slot that takes the material should, of course, be the width of the wall board, and the post should be perfectly plumb to give a square cut. Such a guide will prove especially useful in lumber yards where considerable cutting is to be done. —Robert Poulson.

Handy Cleaner for Cement Floors



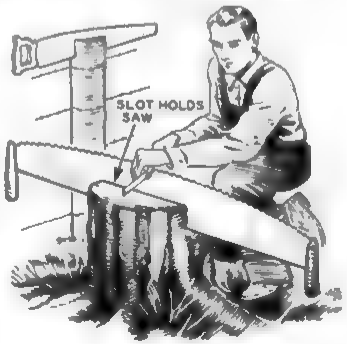
CONCRETE floors in garages, basements and laboratories can be cleaned in a short time if warm water is dashed over the surface and dried immediately with the simple device shown at the right. To make such a cleaner, obtain a thick rectangular piece of rubber and screw it tightly between two heavy boards as illustrated. Then bore a hole in one of the boards and fit an old broom handle in it. Make sure that the handle is strong, as it may be necessary to apply considerable pressure in drying the floor. In use, the device should always be drawn backward towards the operator for best results.—R. H. Balken.

Simple Bag Filler Made From Old Ten-Gallon Milk Can



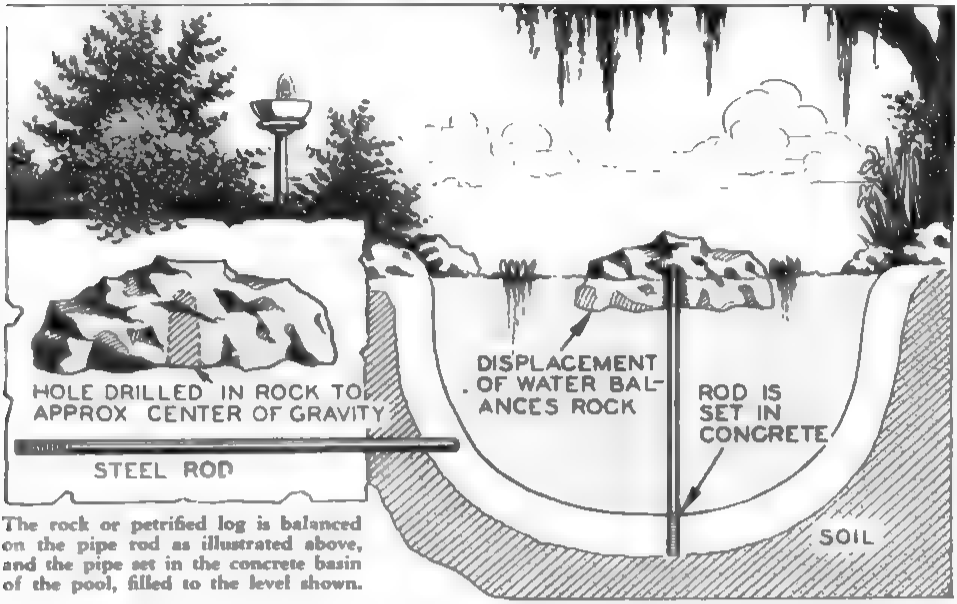
WHEN you have on hand the task of filling bags of spuds, grain, etc., you can save considerable time and effort rigging up a simple filler made from an old ten-gallon milk can. First cut off the bottom as illustrated at the left, then flare out the edge, and solder a row of short spikes or nails around the mouth to hold the bags. Finally mount the can on a stand, constructed as shown in the drawing, inserting it mouth downward. The bag is hooked to the nails and the potatoes poured in as illustrated, the milk can acting as a funnel. —Chas. H. Willey.

Using Stump as Saw Vise



A SIMPLE yet efficient saw vise can be improvised by sawing a slot across the end of a tree stump deep enough to take the saw to a depth within one or two inches of the teeth. Two wedges driven in the cut will provide a firm grip for filing. The teeth to be sharpened should always be over the stump, as this position gives more solid footing for the blade.—W. F. Heisterman.

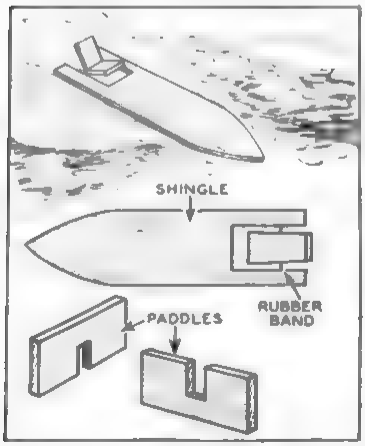
Floating rock decorates lawn pool



The rock or petrified log is balanced on the pipe rod as illustrated above, and the pipe set in the concrete basin of the pool, filled to the level shown.

VISITORS to the home of Mr. Willis A. Rowe, of San Fernando, California, are invariably greatly interested and somewhat amazed to observe a large rock apparently floating among the water lilies of a beautiful lawn pool. Small waves, or any other disturbance of the water, cause the rock to bob around like a piece of floating wood. This floating rock, however, is simply a petrified log, balanced on the surface of the water by means of a pipe rod set in the concrete at the bottom of the pool, as illustrated in the drawing above.

You can amaze your friends like this, too, if you can lay hands on a similar piece of petrified wood. A hole should first be chiseled in the concrete of the pool bottom and a pipe set in it as illustrated. Next drill a hole in the stone to take the other end of the pipe support, taking care to locate a point in the center where the rock is balanced. Water lilies will tend to becloud the water so that the rod will not be visible to observers.—Oswald Bruce.



How paddles are cut and assembled.

Toy Boat From Shingle and Rubber Band

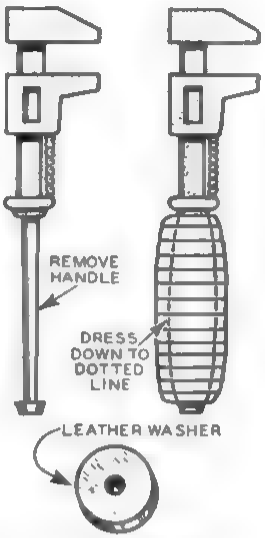
A SIMPLE little toy boat can be made at picnics if you have a jackknife, a shingle and a rubber band or two. Cut the shingle as the drawing shows, so that there is a kind of fishtail in the back. Then whittle two paddles to the shape shown, using the thin end of the shingle, and finally join the blades together.

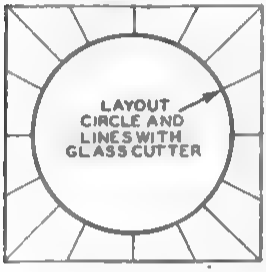
It should be seen that the paddles are small enough so that they will turn freely in the fishtail opening. Then take three or four rubber bands, slip them over the fishtail, and slip the paddle between them. By winding the paddle backwards until the rubber bands are wound up as tight as they can go without breaking, the boat will be found to go forward at a rapid rate when released in water.—T. S. Asgaard.

Kinks for the home craftsman

A Solid Leather Handle for Your Monkey Wrench

HEAVY leather washers cut from thick cheap sole leather that is for sale at any hardware store will serve excellently as a handle for your monkey wrench in case the wooden one breaks off. These washers are cut in circular form and slightly oversize, as illustrated in the drawing at the right. Proper size holes are punched in the centers of the washers, which are then slipped on the iron handle of the wrench. A tight fit is secured by tightening the nut at the end of the handle. The leather handle is then dressed down by holding it against a coarse emery wheel: and if you have equipment you can also burnish the handle with a grinding head.—Lester P. Young.



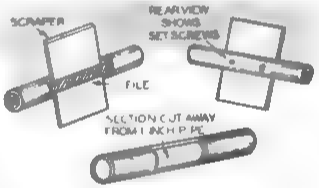


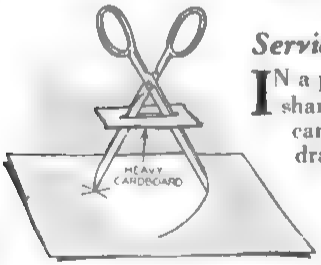
How to Cut Glass Circles

CUTTING neat glass circles is a simple task if you will first lay out the circle on the glass with a cutter in the manner illustrated at the left. Next make cuts every inch or so from the circle to the edge of the glass and finally break off the small pieces to form a reasonably smooth circle.—Waldo Orton.

A Convenient Handle For a Steel Scraper

A CONVENIENT handle for a cabinet steel scraper can be made from a piece of pipe by cutting out a section of it, as illustrated, and boring and tapping two set screw holes in the uncut portion. A file is then run through the pipe and the scraper inserted and clamped firmly in place with the set screws.—Jas. Mann.



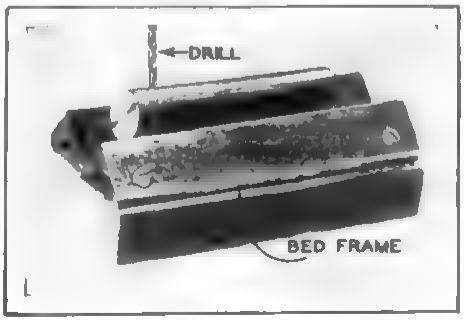


Serviceable Compass From Scissors and Card Board

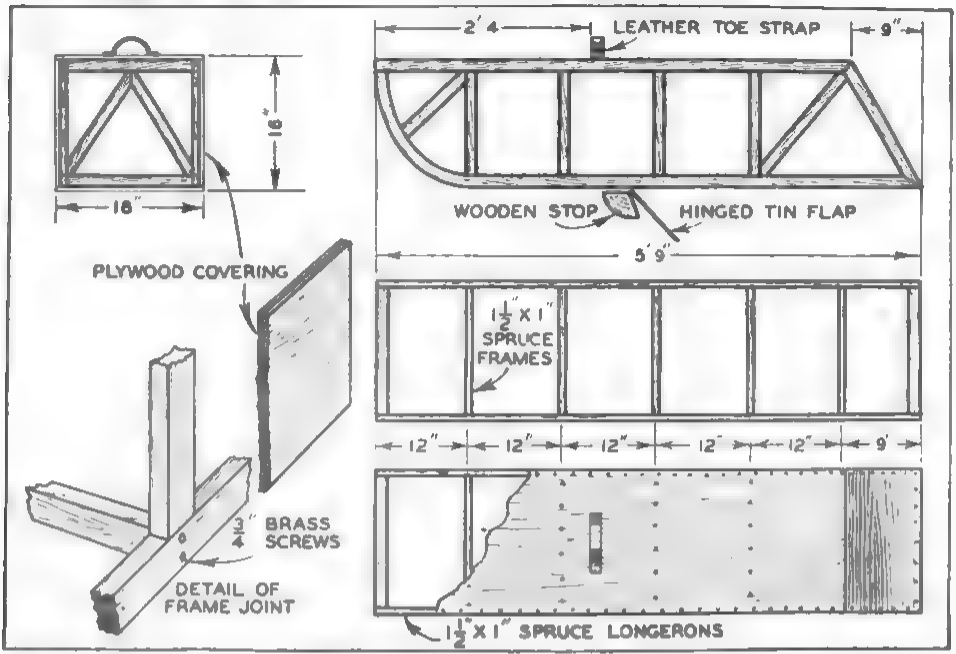
IN a pinch you can make a fairly efficient compass from a pair of sharp pointed scissors and a piece of heavy cardboard. The cardboard is slotted in the middle in the manner shown in the drawing at the left, and the scissors inserted in the slot. The size of the circle is regulated by moving the cardboard up or down as desired. The scissors may be notched to prevent slipping.—Walter Mason.

Angle Irons Make Bed Frame

DRILLING a circular steel rod is an extremely difficult task if you have no vise for the job, but the situation may be mastered by constructing a simple bed frame from two angle irons. These angle irons, which should be about eight inches in length, are bolted to a block of wood as illustrated in the photo at the right, and the rod placed in the V-shaped groove for drilling.—Bill Reed.



"Miracle shoes" to walk on water



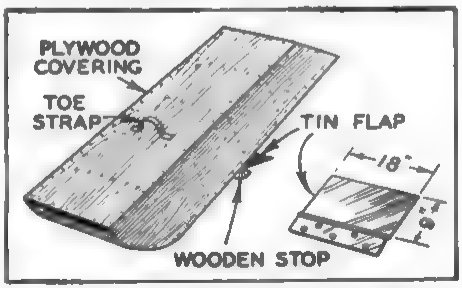
The spruce frames for the water shoes are assembled as shown. The hinged tin flap prevents sliding.

WALKING on water might have been a miracle in the old days, but anybody can do it in this modern age. All you have to do to perform such a stunt is to build two simple pontoons such as described herein. With them you can walk right across a calm lake and have loads of fun doing it.

The first thing to do is to construct the four side panel frames shown at the top in the above drawing. The longerons are made of spruce stock 1½ inches square, the bottom one being bent as illustrated. The bending can be effected by soaking the wood in water overnight. Then the next day wrap the pieces in wet rags and hold over a coal fire till the rags catch fire. This will steam the wood, making it pliant.

The next task is to assemble the completed frames, which is accomplished by connecting the side frames with the 1x1½-inch pieces of spruce, and bracing them internally as illustrated above. Use ¾-inch brass screws here. These frames are then covered with 3/16-inch plywood, screwed on with ½-inch screws.

A pair of toe straps are next screwed to the top of the float. It is best here to fasten on an extra piece of square plywood to give additional support. The straps should be of heavy but pliant leather, about one inch wide. To keep the floats from sliding backward when you move, attach a pair of tin flaps, 18 inches long and 9 inches wide, to the bottom, hinged and braced by a block as shown in the above drawing. The floats should finally be caulked tightly, and painted with four coats of thin lead paint, or better, covered with canvas. Any number of thrilling water sports can be played with these water shoes, polo being the most interesting. They should be a part of the equipment of any beach.—Donald Mains.

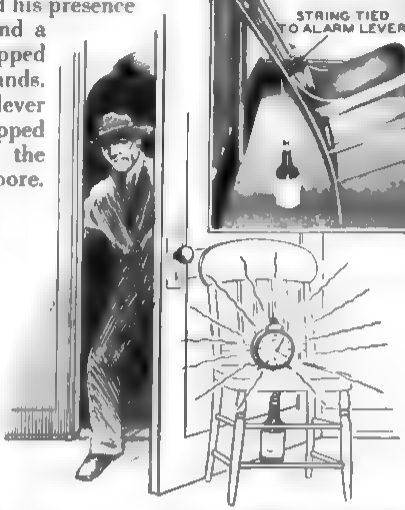


This drawing shows tin flap and completed shoe.

Novel ideas for the household

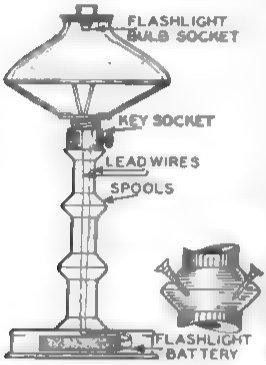
Clock, Bottle and Chair Make Novel Burglar Alarm

A NOVEL little device which will frighten off burglars and at the same time announce to the world his presence may be made from an alarm clock, a chair and a bottle. The works of the clock first should be stopped and the alarm set at the time indicated by the hands. The bottle is then connected with the alarm lever with a string and the clock set on a chair tipped against the door. When the door is opened the string will release the alarm lever.—Frank Moore.



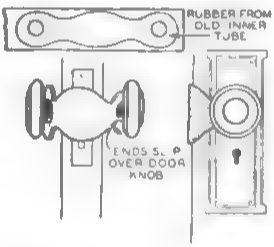
Attractive Light For Sick Room From Spools

A FEW simple spools form the supporting stand of a simple little light for the bedroom, lit by flashlight batteries as illustrated at the left. Wires are led up through the spools to a flashlight bulb which sheds a dim light over a sick room.—Hans Kutschbach.



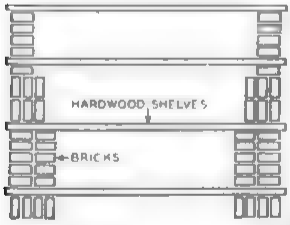
Effective Door Silencer Made of Old Inner Tube

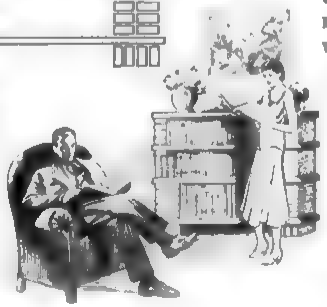
DOORS that open or close noisily can be silenced in short order if you can lay hands on an old inner tube. First take a pair of heavy scissors and cut from the tube a piece of rubber about five inches long, and then cut it to the shape shown in the drawing at the right. This piece is then simply slipped over the two knobs as shown to silence the jar, the rubber acting as a shock absorber when the edge of the door strikes the jamb.—Thomas Muller.



Bricks Make Unique Bookcase

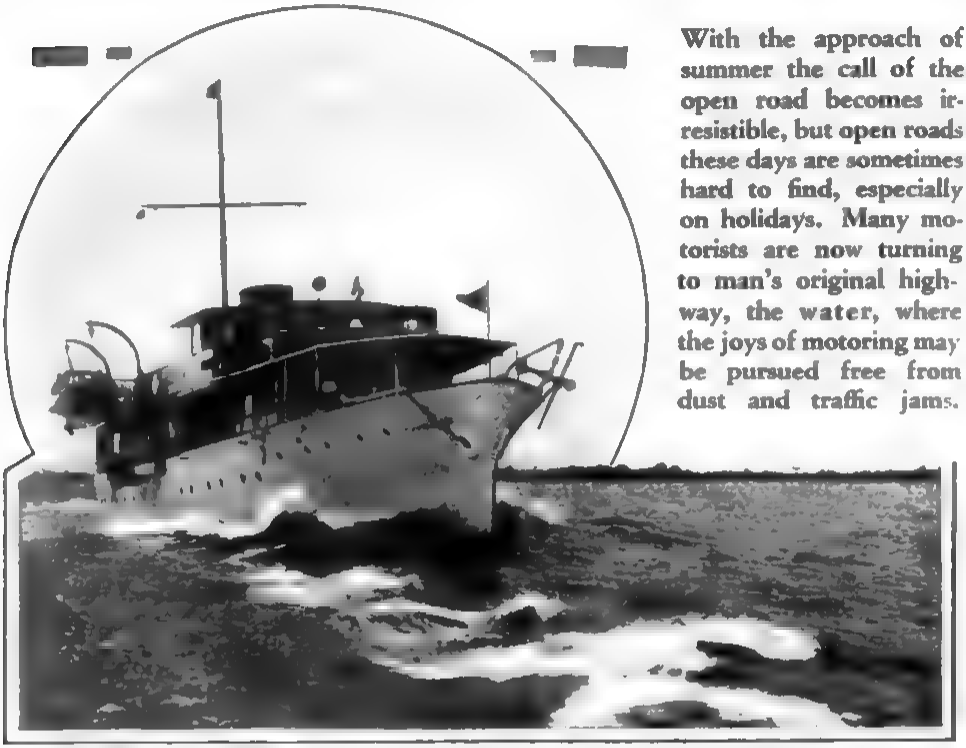
HERE is a unique and attractive bookcase that, requiring no nails in its construction, is as easily and quickly built as a child's block house. Lending itself to a variety of treatments in design and color scheme, it can be made a very admirable feature of the home, as well as a very attractive one. When built as illustrated in the accompanying drawing, four boards and fifty bricks are required. The bricks are laid without mortar to support the four shelves, which are of one inch stock, four feet long and eight inches wide. The first shelf is about four inches from the floor, and the others are about ten inches apart, extending about an inch beyond the bricks at the end, and in front also if desired.—Charles Byers.





In building this unique bookcase, the bricks and shelves are placed as shown. The boards extend about an inch beyond the bricks.

MOTORING on the



With the approach of summer the call of the open road becomes irresistible, but open roads these days are sometimes hard to find, especially on holidays. Many motorists are now turning to man's original highway, the water, where the joys of motoring may be pursued free from dust and traffic jams.

Arthur Wheeler's luxurious 135-foot Diesel yacht, built by the Consolidated Shipbuilding Corporation.

MOTOR boating, once looked upon as a pleasure and luxury to be enjoyed exclusively by aristocrats, has been so developed by mechanical skill and scientific efficiency that it now lies within the grasp of the family of moderate means. This summer and fall will see thousands of new enthusiasts joining the army of 1,500,000 owners of motor craft.

The makers of motor boats have packed scores of temptations into their 1931 models, defying the lover of life on the bounding main to turn a deaf ear to its siren call. They have made it so that any one who can afford to own an automobile on the most liberal instalment plan cannot resist the picture of a cruise in which he is the master of all he surveys, including the trim little runabout motor boat which he controls.

The 1931 motor boat owner and fan doesn't have to be versed in mechanical, engineering, electrical and combustion subjects. Running a motor boat has now become simpler than driving an automobile. All you do is step into the boat, press the starter, engage the gears and off you go. There are no traffic jams, no cops, no dust, no detours, no great risk of smashups.

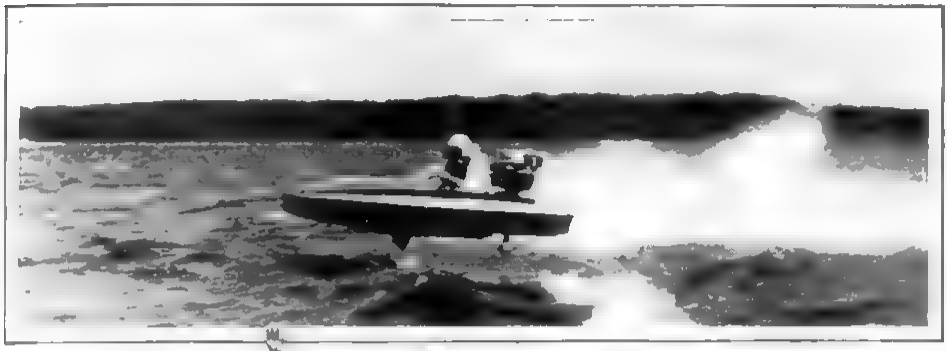
What's more, the boat manufacturers are out this year to beat not only the automobile industry with their tempting modes of travel but also hope to put a dent in the hotel trade. Their weapon is the floating homes, of the house-boat type. Their interiors resemble the ritziest hotels in the way of luxuries, right down to the radio receiving set.

These floating miniature hotels have living and sleeping quarters, cooking and dining compartments, baths, wardrobes, berths, both open and enclosed decks.

The 1931 allurements in motor boats of the floating vacation homes style were ex-

Bounding Main

by DICK HUNTER



Contrast this speedy little outboard craft with the yacht on the opposite page. There are hundreds of motor boat designs between these two extremes.

Here's a 15½-ft. outboard runabout which combines economy, speed, and seaworthiness in heavy going.

plained further to me by Jay W. Smith, president and general manager of the Chris-Craft Corporation.

"Women have brought about an entirely new conception of the design and equipment of the motor boat," he said. "In the earlier days of motor boating, only the barest utilities were provided. A good boat that would stand the gaff, that had power and speed, that would get there and back, was all that was required.

"Motor boating was a man's sport, and he didn't mind any discomforts that went with it. In fact, it was an outing and he enjoyed roughing it. But the motor boat has become as much a family matter as the automobile, and, you might say, even the home itself.

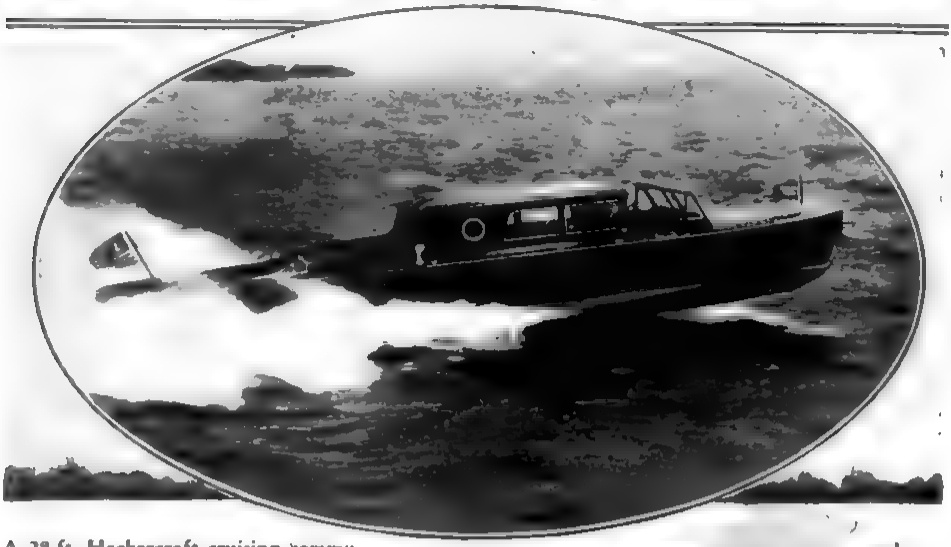
"This brought about entirely new standards of motor boat construction. Many features that were never thought of before became necessary. Luxuries and conveniences were required and we builders of motor boats had to provide them.

"Comfort is no less a feature than charm. Broad seats at each side of the cabin are thickly upholstered over deep 2-layer springs and made luxurious divans by day. For sleeping, the backs of these divans swing up and are strapped securely to form upper berths, while the stationary seats make the lower berths.

"The cooking compartment is equipped with a dependable alcohol stove, an efficient hot pan, a refrigerator which is iced from the deck, a disappearing sink and handy lockers for storing food and utensils. A specially constructed shelf keeps china and glassware safe in all weather.

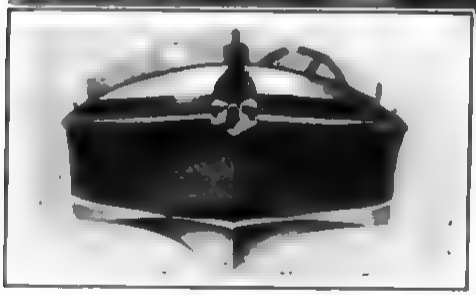
"There are private washrooms. One model is provided with a showerbath. The cabins are completely lighted so that light is available wherever desired. All openings in the cabin are protected by heavy wire screening, thereby keeping the boat as free from mosquitos and other insects as one's own home. Windows are absolutely leak-proof.

"Nearly all 1931 models have the distinctive V-bottom. This feature eliminates pound and roll and affords much more deck room in the cabins and cockpits. Most bot-



A 28-ft. Hackercraft cruising commuter with comfortable cabin arrangement, powered with two Kermath 225 h.p. engines and is capable of 41 m.p.h.

Economy of space has been the watchword in designing this 24-ft. Elco Deck Cabin cruiser, where two roomy sleeping compartments are found.



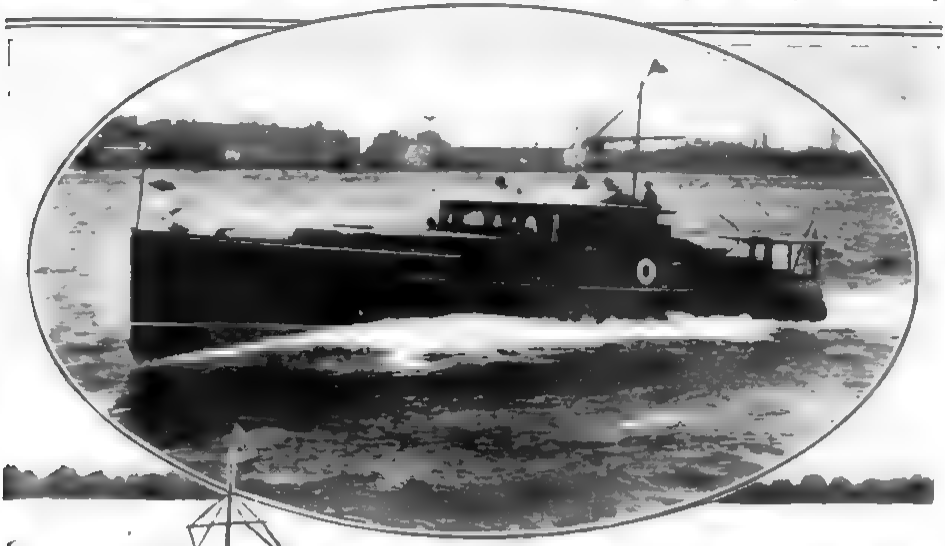
This light, five-passenger outboard runabout has a soundproof hatch for the twin cylinder motor.

toms, too, are double planked with heavy canvas between the wood layers. This laminated construction, the strongest known to marine engineers, makes these bottoms leakproof and eliminates the need of caulking."

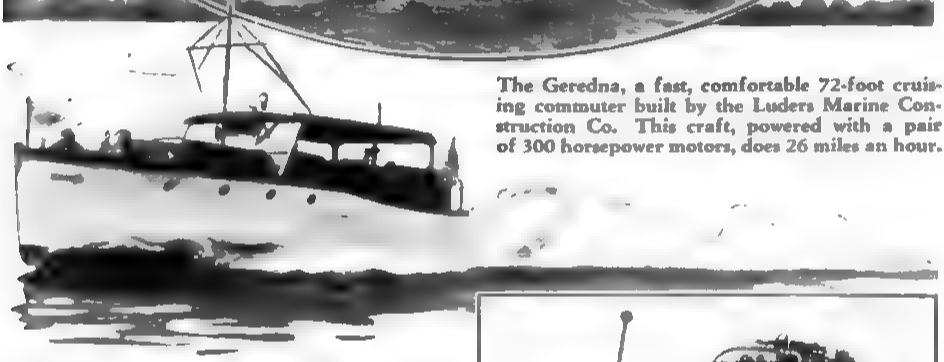
Mr. Smith was describing the small cruiser which has taken the lead in motor boat developments. A new crop of runabouts and outboard hulls are also making bids for popular favor. Only recently it was revealed that about ten runabout builders have invaded the cruiser field, while a number of outboard manufacturers have launched into the inboard field.

Despite the dark clouds of depression which hung over the country last year, the motor boat manufacturers plunged steadily forward, increasing their factories and facilities until today there are about $300,000,000 invested in the business of making motor boats and equipment, employing about 50,000 highly trained mechanics and engineers.

The cruisers this year range from 22 to 30 feet, made to meet the demand from veteran small boat owners for a small, inexpensive boat which will carry on in choppy waters in elegant style, and possessing all the comforts of steering shelter and conveniences. The 22-foot cruiser is favored for idling away summer afternoons, for duck hunting or for a racing yacht tender. Looking over the number of boats in this class, one



The Geredna, a fast, comfortable 72-foot cruising commuter built by the Luders Marine Construction Co. This craft, powered with a pair of 300 horsepower motors, does 26 miles an hour.

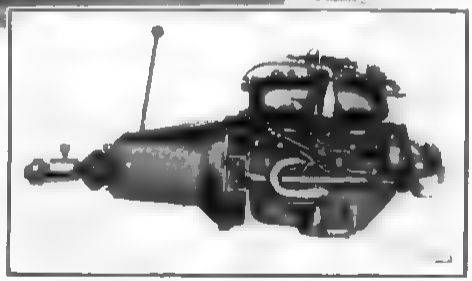


A 36-foot Whitneycraft cruiser, costing no more than a good car, has berth accommodations for six people in its roomy cabin.

finds that a mighty good craft of this type can be purchased for $2,000 on a very easy-payment plan. Only two years ago, several makers told me, this price would have been considered phenomenal.

From Henry R. Sutphen, president of the National Association of Engine and Boat Manufacturers, I learned more about the phantom magnet which the boat builders have thrown before 1931 sea-life devotees. He declared that the manufacturers count on selling $30,000,000 worth of boats this year.

"Throughout the nation," said Mr. Sutphen, "cities are building harbors; villages are constructing service stations; the government is improving the waterways and there are miles and miles of uncrowded, uninterrupted open roads inland and on the seaboards. Seventy per cent of the earth's surface is water. An appreciation of all this has



The Barker conversion of the Model A Ford motor provides an economical power plant.

attracted more and more people to the water as is shown by the registration figures in the customs districts. In one class of boats alone, the number has grown from 91,000 ten years ago to 250,000 today. In still another class, the numbers have increased from 100,000 to 400,000 in the past decade.

Aside from the conversion of automobile motors into boat motors, the 1931 array of craft reveals that inventors and mechanics have come forward with many new devices for the boatman's aid. Diesel engines are

Don Barclay, former Follies comedian, gave up aviation for outboard racing.

A Marblehead cruiser designed especially for the sportsman-fisherman is shown above. It provides roomy accommodations and operates at low cost.

The roomy and luxurious interior of a 38-foot Chris-Craft cruiser—only one of a fleet of 32 types offered by the Chris-Craft Corporation.

again in pre-eminence. Radio manufacturers have come through with sets which might easily be imagined as having been transferred from the parlor at home to the bridge deck or the guest cabin.

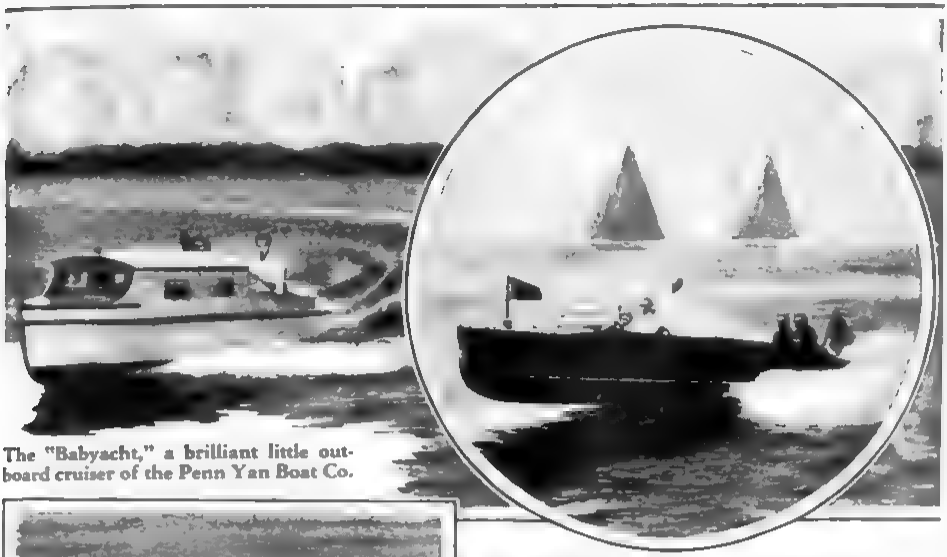
One of the most recent devices installed on motor boats is a carbon dioxide fire-fighting equipment. There is no greater danger on board a boat than that of fire, and until recently the facilities to fight it were often inadequate. This modern system consists of tanks of the gas located at various points of vantage throughout the craft. When fire is discovered, a control handle on the bridge releases the gas, which promptly and efficiently smothers the fire.

There is another instrument to add to the peace and the pleasure of the 1931 mariner by motor boat. Any water motorist knows that there is nothing more obnoxious than the noise of the exhaust. A silencer has been invented that fits on the exhausts of the power craft, reducing the roar to a purr. Although manufacturers feared that this device might be more of a blessing for rum-runners, wishing to get to shore with as little noise as possible, it has been taken up by regular motor craftsmen.

Several new compasses have appeared this season. One of these has two sets of parallel lines, one on the card, the other on the frame, aiding the amateur in accurate steering. In addition to this the weight of the magnetic element has been reduced to a minimum, thus increasing the damping factor. It also facilitates the sighting of landmarks and the triangulation of position.

There is still another new compass which is on the order of the Iron Mike and is called the Director steering compass. It is an automatic steering device in which a United States Navy Standard No. 1 illuminated magnetic compass is used.

In this type of compass, the changing indications of the compass card control an electric circuit without detriment to the action of the compass. Thus it controls a small steering engine, which operates the steering mechanism of the vessel. This steering engine may be instantly disconnected to permit



The "Babyacht," a brilliant little outboard cruiser of the Penn Yan Boat Co.

Floyd Gibbons is shown scooting over the waters of Long Island Sound in a 22-foot Chris-Craft runabout capable of doing 30 miles an hour.

Another 22-foot runabout which makes 30 m.p.h. with a 100-horsepower motor. This speedy craft costs about the same as a medium priced car.

hand operation, or the hand wheel may be turned against the engine in case of emergency. The rudder response to the compass may be adjusted to fit all sea conditions, ranging from a calm to a severe following sea.

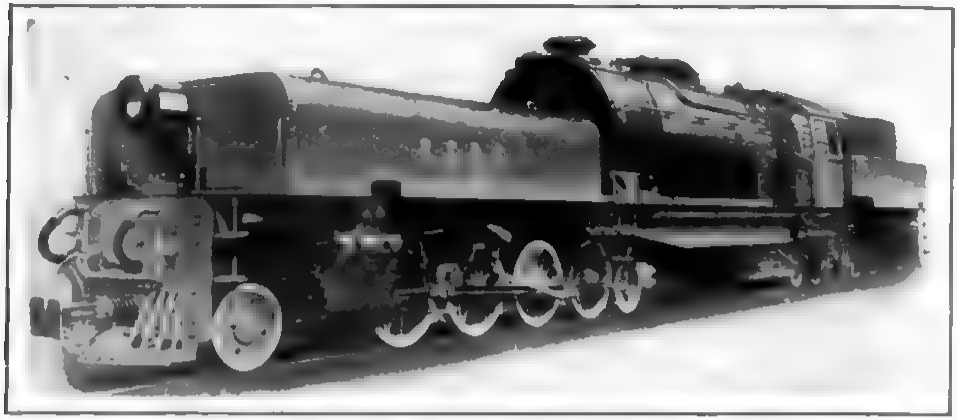
Electricity has come into its own as part of the cruiser's equipment. Much of the auxiliary equipment on the 1931 motor boats is controlled by electricity. Winches, pumps, cooking apparatus, steering, signals and lights are operated by electricity. One of the most up-to-date arrangements is a small Diesel lighting plant that works efficiently on a small supply of fuel oil.

In addition to the uses of radio as a form of entertainment as already explained, the motor boatman who operates the cruiser type of craft finds more utilitarian services for radio to perform. Weather forecasts are available to him regularly on the air. The government also maintains radio-bearing stations up and down the Atlantic and Pacific coasts, and by the manipulation of the attachment on the radio the mariner who is offshore beyond sight of land can ascertain his exact position by getting the compass bearings of two or more of these stations and working out their lines of bearing on his chart.

Then again, the exact time is a vital factor in the calculations of the navigator who is working out the position of his boat by celestial observations, and the frequent time signal broadcasts help him by showing whether his chronometer is correct and, if it isn't, what the error might be.

It is not difficult to drift in a discourse on the motor boat type of navigation into the higher spheres where the complex computations are solvable only by mariners of long experience with the elements and the sea. But it just goes to show into what depths and possibilities the enthusiastic motor boat fan might fling himself if he has a fairly sturdy cruiser with which to experiment. The problems of the masters of smaller craft have been shorn of all complexities and difficulties by the manufacturers. The fun is there for the seeking.

Novel German Engine Has Two Flexible Driving Units



The new locomotive, developed by German engineers, which has extra water tank on front and two flexible units fitted with pivots on which boiler and tank rest, providing maximum traction at high speed.

ABOUT the strangest thing in the way of locomotives yet to make its appearance upon the rails is a new engine recently developed in Germany which appears to be backing up when it is really going forward. What gives it this strange appearance is the extra water tank and driving unit on the front which looks like the tender of the car.

The chief features of the new locomotive are the two driving units which have a flexible connection with the rigid frames on which the boiler and extra front water tank are supported. The front and rear cross stays of the frames are fitted with a short cylindrical pivot pointing downwards and resting in sockets carried on the cross members of the driving unit frames.

This articulated arrangement permits the construction of heavy engines with as high as ten and twelve axles, and combining maximum traction with high speed. Two other chief advantages of the engine are that, owing to its large wheelbase and flexible driving units, there is less danger of derailment on curves and a greater distribution of weight on bridges.

Machine Cooks Flapjacks, Turns, Delivers Them to Plate Automatically

This machine feeds cake batter to electrically heated plates which cook the cakes automatically.

GRIDDLE cakes are baked automatically in a new machine which functions either upon the mere pressing of a button or the placing of a coin in a slot. It feeds the batter to plates which are electrically heated and kept at a uniform temperature by means of a thermostatic control. The cakes are cooked without grease, turned automatically, and finally deposited on a waiting plate, by means of automatic mechanism driven by a motor. The regulator of the device can be set to cook an order of three cakes, or two, three or four orders of three cakes, or it can be operated continuously. The machine is glass encased, is four feet wide, two feet deep and three feet high, and is being used by drug stores, road stands and self-service restaurants. Engineers are now working on similar devices which will fry or boil eggs and perform other such cooking tasks. In the future housewives will merely have to press buttons.

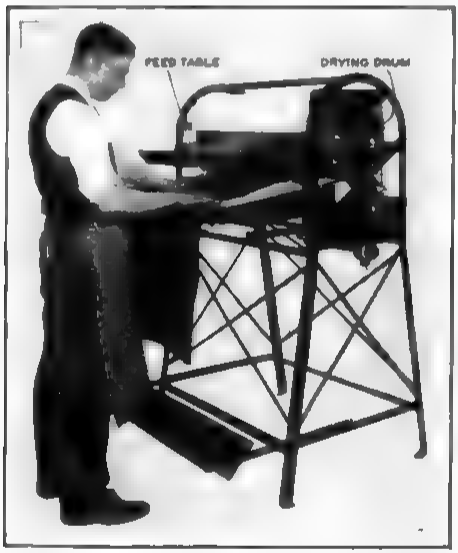
Unique "Ro-Railer" Car Travels on Road or Train Tracks

AN entirely new idea in the world of transportation is represented in the development by British engineers of a car, called a "Ro-Railer," which can travel on either railroad tracks or on a roadway. Equipped with wheels that have both rubber tires for road travel and flanged wheels for rail travel, the car can change from track to road or vice-versa after a five-minute adjustment of the wheels.

The car is designed for use on branch lines.

Wheels of this new "Ro-Railer" car, designed for travel on tracks or roads, have adjustable wheels with flanges for rails or rubber tires for road. Conversion from train to automobile takes only five minutes.

Print Drier Does Work Instantly



Prints are dried in few minutes with the electrically heated drum of new dryer, shown in photo above.

DRYING prints instantly, leaving them smooth and free from wrinkles, is the amazing task performed by a sheet drier recently placed on the market. The prints are fed into an electrically heated dryer up an inclined table which drains water away from the revolving drum, and then returned to an adjustable tray. All the work is done automatically, and at a minimum of time and expense.

Air Currents Cause Lath Marks

MILLIONS of people who have wondered why dust accumulates on plastered walls in stripes over spaces between the laths and rafters underneath now have the mystery solved by scientific experimentation. An eminent physicist reports that the alternate layers are due to heat, which affects the movements of the air currents and of the tiny particles of dust always suspended in the air. The dust settles in the spaces between the laths because these tiny air currents tend to draw the particles to porous parts of the wall. If the entire wall were of equal temperature this action would be eliminated.

New Bathing Cap Simulates Hair

A NEW bathing cap recently placed on the market has the appearance of human hair and fits snugly over the head, with doughnuts over the ears, as illustrated at the right. The hair is embossed in rubber on the caps, which can be obtained in any color to match the hair of the bather.

This new swimming cap simulates human hair.

Easy Juggling

Tricks of the juggler aren't always as difficult as they seem to be. With a few simple preparations, as described in this article, you'll be able to stage a juggling exhibition which will leave your audience gasping at your skill.

This looks like a difficult stunt, doesn't it—balancing a dozen safety match boxes end on end? But it's easy when you know how. The inner drawers of the successive boxes are pushed open slightly, as shown in the photo at the right, affording a slight hold sufficient to support the pile. The audience never guesses this little secret.

ONCE upon a time there was a man. And he did a very clever trick with seven matchboxes. He held one box in his left hand. And on this box he balanced the six others. And people thought he was very clever. But he only laughed . . .

He laughed because the whole trick, like many another juggling trick, was so simple. Try it for yourself: After taking the first box in your left hand, you must secretly push out the drawer about one-half inch; and, since the back of your hand is towards the audience, this passes unnoticed. Box Number Two is then set in place. As you adjust it carefully on top of the first box, you must casually push the drawer down so as to fit into the empty cover space of Box Number One, as shown in the photograph. Each succeeding box is fitted into place in a similar manner. The slight hold obtained by this ingenious subterfuge is sufficient to hold as many as ten or twelve boxes in an upright position.

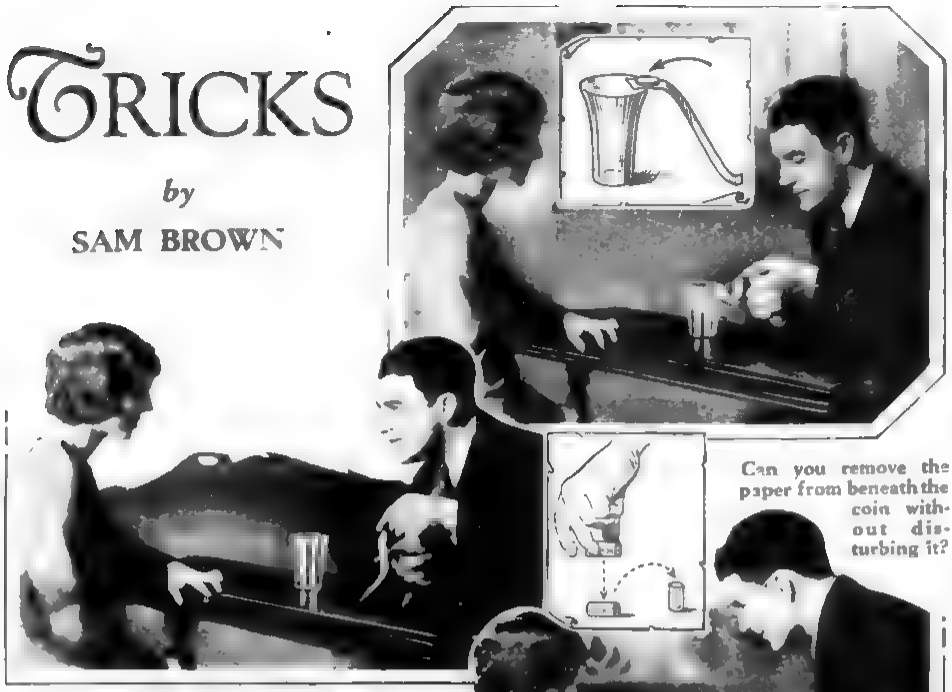
To release the whole mass, you need only rest your right hand against the top of the uppermost box, and, with the left hand, push the drawer of the lowermost box up into place. The action of pushing the lowermost drawer home will result in a similar action along the whole line, and each drawer is fully returned to its respective cover. The final move is to remove the supporting influence of your right hand, and then—Bang!—down comes your castle of matchboxes, and a mystified audience is left without a single clue as to the *modus operandi*.

Here's something else. The performer exhibits a cork—the plain untapered kind which were so much in vogue before Mr. Volstead spoke his piece. Anyhow, the idea is to drop this cork onto the table from a height of about four inches so that it will stand on end. Try and do it! The average spectator will attempt to drop the cork lightly on end, but due to its great elasticity it promptly rebounds and falls on its side. And that's the whole secret. If a cork, dropped

TRICKS

by

SAM BROWN



Problem: How to remove a paper strip from beneath a coin balanced on a tumbler's edge, without disturbing the coin. Secret: Tap the paper strip smartly with the forefinger of right hand, holding strip's end with left, as shown.

on end, rebounds and falls on its side: then the same cork, if dropped on its side, will rebound and fall on its . . . Right you are, old man, as the Englishman would put it, that's just exactly how you do it.

To drop a cork and make it stand on end, let it fall side first and it will bounce as indicated in the small drawing.

Listen to this one: A coin is very delicately balanced upon the extreme edge of a tumbler, and beneath the quarter—or whatever the coin may be—a slip of paper is placed, as shown in the diagram. The problem is to remove the paper without touching or upsetting the coin or glass. The average person attempting to do the stunt will either try to jerk the paper away or else remove it very gently from beneath the coin. In either case, the result is the same—it simply can't be done. If you will hold the free end of the paper in your left hand, however, and then strike the center of the paper sharply with the forefinger of your right hand, as shown in the photograph, you will find that the paper slips out quite readily. In fact, you will be somewhat surprised to notice how motionless the coin remains.

This next item has to do with the balancing of a stick of gum on the knuckles of your left hand. Moreover, the stick of gum rises and falls at the performer's command in a manner that is quaintly mysterious. The "nigger in the woodpile," in this case, is a straight pin. This is clipped between the second and third fingers of the hand, and the gum is slipped over, as shown in the photograph. Get a pin and try it! By flexing the muscles of the hand, you will soon see how Mr. Gum so unhesitatingly obeys the performer's commands about going to bed and getting up in the mornings.

In this next little conceit, the performer takes two matches. He lights them and holds one about two inches above the other. With a light puff of his breath, the performer extinguishes the *lowermost* match. It is clearly

Issue orders to this stick of gum, balanced between the juggler's fingers, and it obeys them implicitly. The gum lies down, gets up, does the shimmy, and performs all manner of gyrations on order. The secret lies in the use of a pin. The point is pressed into the gum, as shown, so that it can be manipulated by the juggler's thumb.

Above is shown a puzzling match trick. Two matches are lighted and held one above the other. The lower match is blown out, but the flame from the upper reaches down and re-lights it. The preparation for this effective stunt is simple. The lower match is simply dipped in paraffin before it is ignited. If you think it won't work, try it!

out. And yet . . . *mirabile dictu* . . . the flame from the *uppermost* match is seen to slyly slip down the rising smoke from the lowermost match and set it once more on fire. The whole secret is in the match. One of these, the lowermost one, has been previously dipped into paraffin. That's all there is to it. If you're a Doubting Thomas, get some paraffin and try it!

For a novel and useful bit of legitimate juggling, try tossing a cigarette from your right hand into your mouth, as shown in the photograph. It really can be done. If you have the patience, and have seen the Hon. Douglas Fairbanks perform the stunt, you may, with practice, achieve sublime success. In the end you'll probably give up, thoroughly baffled. And it's here that the clever work commences. If you will take a cigarette and slightly "gimmick" it by inserting a small metal weight in one end, as shown in the sketch, you will find the juggle comparatively simple—as certain as the archaic boyhood juggle of tossing peanuts into the air and catching them in your mouth. Moreover, you can defy Mr. Gravity with this prepared cigarette by balancing it on your hat, on your finger tip, or letting it lean far out over the edge of a table, as shown in the photograph.

Another legitimate bit of juggling—that is, it's supposed to be "on the square" consists of dividing an apple. And how! The "and how" is what makes the trick so clever. The apple is neatly parted in the center by striking it a quick blow with the lone forefinger!

No, it's not necessary to be a strong man. Merely take your thumb nail, and while nobody is paying particular attention, run the nail completely around the fruit so that the apple's skin is broken all around. That's all there is to it. By striking the apple with the side of the hand, or even with a single finger, it can be easily parted into two equal segments, as shown in the photograph.

You've seen the stunt of balancing an egg on end—either end. It's popular enough to repeat the explanation of how it's done. The egg is blown of its contents by drilling a tiny hole in either end and forcing the contents through one hole by blowing at the other with the lips. Then the egg is partially filled with fine sand, the holes sealed up, and the egg stands in any position in which it is

Difficult Cigarette Stunts Made Easy by Insertion of Weight in One End

Balancing a cigarette with three-fourths of its length overhanging a table edge is easy if you insert a metal weight in the fag, as diagrammed.

Tossing a cigarette into your mouth is easy if there's a weight in the end, but it's a stunt which will take you hours to master with an ordinary cigarette.

It doesn't take a strong man to split an apple in two with a finger blow. The thumb nail has surreptitiously broken the apple skin before the trick is demonstrated.

placed if you are careful to shift the sand to balance it.

The next time you pay your check at the restaurant, you can puzzle the cashier with this trick: You apparently lay down a fifty-cent piece on the counter — the cashier hears the audible click of the coin being deposited—yet when your fingers are removed, there's no coin there. The explanation is simply a matter of clever juggling.

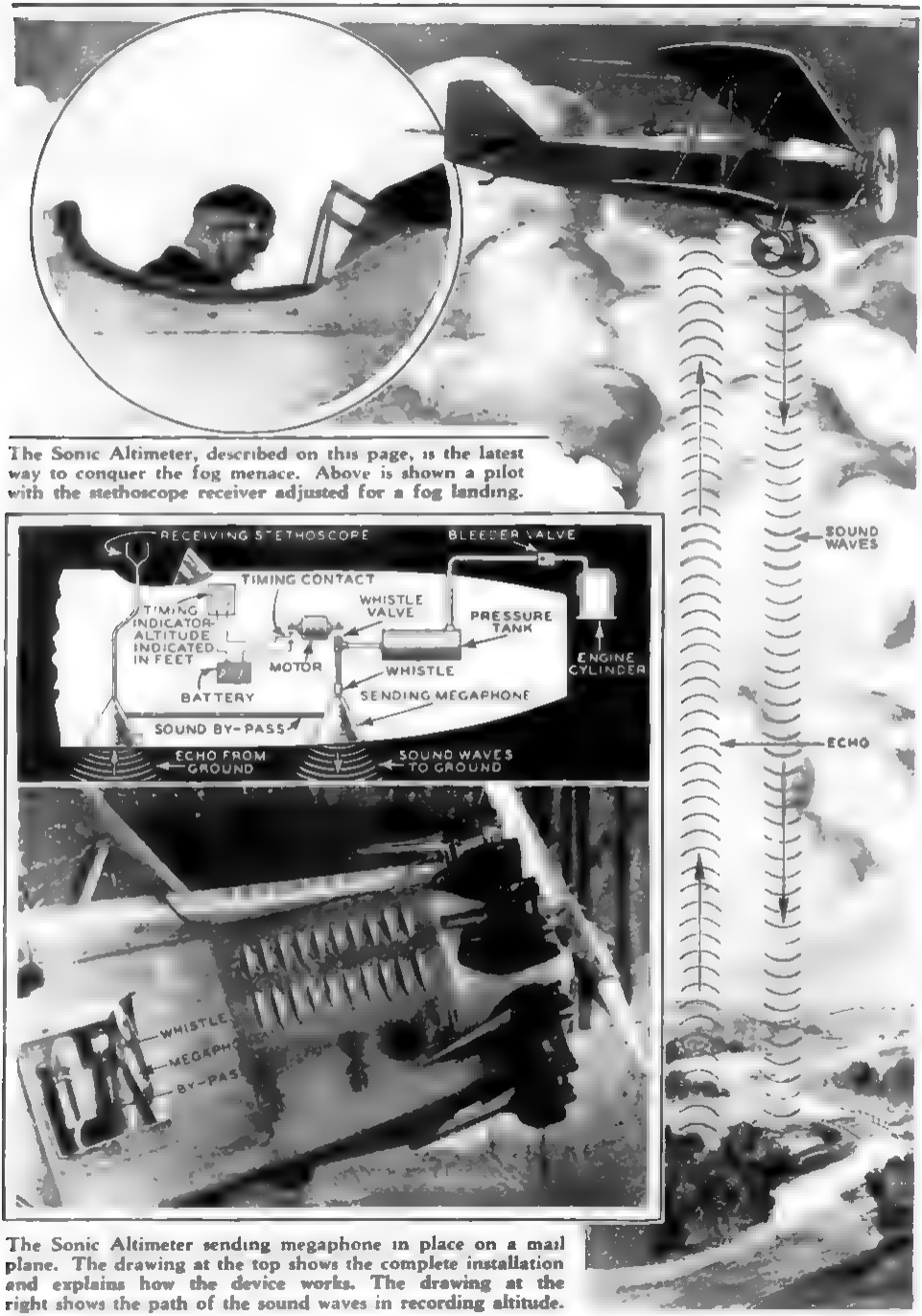
Displaying the coin in the fingers of your right hand, you transfer it, during the process of turning your hand over, to the left. The fingertips of both hands are then placed down on the counter, the left some distance away from the right, which holds the center of attention because it apparently is the one containing the coin. But it ain't so: the coin which made the noise when it was slapped to the table is under the fingers of the left hand, where it is eventually disclosed after the puzzled victim has done a lot of unnecessary searching about in a vain effort to discover what has become of the missing money.

Here's another one: Place a twenty-five cent piece upright on a flat table, and support it with the tip of the index finger, which is held parallel with the table. Then, stroking the finger supporting the coin with the index finger of your other hand, you inform your breathless public that the friction induced by this stroking will cause the quarter to spin when your finger is removed. It does—but here's how:

Just before releasing the coin from under your finger, the thumb of the hand doing the stroking catches the quarter along one side and gives it a flip which imparts its spinning motion. Thus there's a purely mechanical basis to the stunt, but the observer is rarely sharp enough to "catch on" to the method.

Like most stunts, these juggling tricks require a little practice, but they are by no means beyond the average person's ability. They arouse the curiosity and make your audience ask you, "How do you do it?" They won't be satisfied until you tell 'em. As to the trick of balancing a dozen balls in the air at one time—that's something else again!

KEEPING Up-To-DATE



The Sonic Altimeter, described on this page, is the latest way to conquer the fog menace. Above is shown a pilot with the stethoscope receiver adjusted for a fog landing.

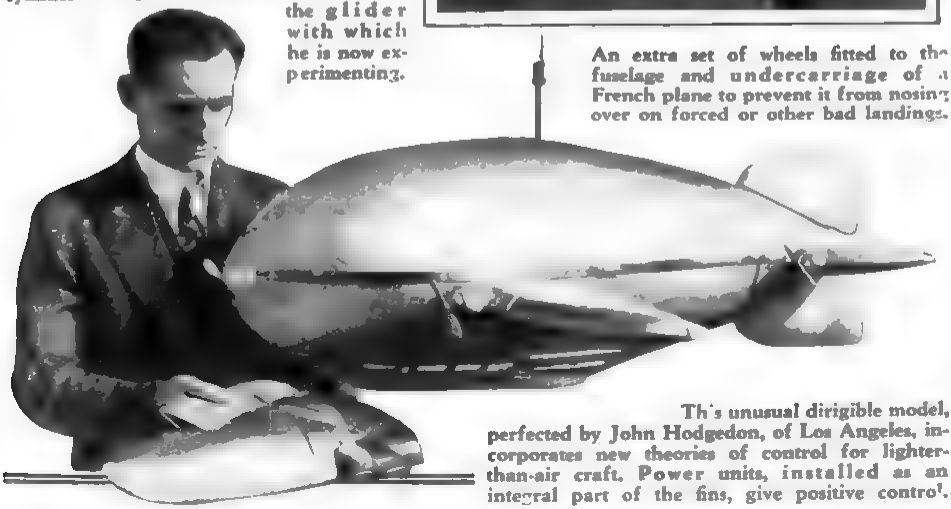
The Sonic Altimeter sending megaphone in place on a mail plane. The drawing at the top shows the complete installation and explains how the device works. The drawing at the right shows the path of the sound waves in recording altitude.

with Progress of AVIATION

Hans Richter, a well-known German aviator, making an experimental flight in his bird-like biplane glider, propelled by a small motor attached to one of the wings in front of him, as illustrated.

A close-up of Hans Richter and his one-cylinder motor attached to the frame of the glider with which he is now experimenting.

An extra set of wheels fitted to the fuselage and undercarriage of a French plane to prevent it from nosing over on forced or other bad landings.



This unusual dirigible model, perfected by John Hodgedon, of Los Angeles, incorporates new theories of control for lighter-than-air craft. Power units, installed as an integral part of the fins, give positive control.

A Ford-Powered 2-Place

by **B. H. PIETENPOL**

The greatest light airplane "how to build" article ever published—that's what the fans are saying about this construction article on the remarkable Pietenpol Air Camper, which flies two persons with a Model A Ford motor, and does it with a zip and flourish which makes it a real tribute to the engineering brains and skill of its designer, B. H. Pietenpol. He has built five of these planes, thoroughly testing out the soundness of the design and motor in thousands of miles of cross-country flying. The ship can be built complete for less than $500.

YOU fellows who have been looking forward to seeing the plans of the Pietenpol will remember that last month we talked about her in MODERN MECHANICS AND INVENTIONS. There we told about her general characteristics, how she came to be, and how to build several of her parts.

The construction of the wooden fuselage was shown, too. This month we take up the story of her salient features with an exposition of the steel-tube fuselage.

Now this fuselage is unique in many ways. It is designed to meet all of the requirements of the Department of Commerce. All the load factors have been diligently worked out by one of the most skilled airplane engineers in the country. His name is Joseph Wise, of the engineering faculty of the University of Minnesota.

When I was talking about the publishing of the Air-Camper plans with Weston Farmer, he suggested that we get a steel-tube fuselage designed which would satisfy all of the boys who wanted steel-tube jobs. The conversation we had ran something like this:

"I'm working up a steel-tube fuselage, too. We could run that," says myself.

"Good idea," answered Farmer. "But let's get one from Wise. He'll give us a detailed stress analysis, and while the job will not be any better than your time-tried wooden fuselage from the standpoint of usability or practicability, still it will have an added value to the fellows who would like to build either way or who would like to compare the two methods of going at the thing."

So Prof. Wise did the job, and the plans are shown in this installment. The tubing specified is of the standard variety, obtainable from any aeronautical supply house such as the Heath Airplane Co., 1727 Sedgwick St., Chicago, Ill., or the Church Airplane Co., 4844 Nevada St., Chicago, Ill. The size of the tubing is shown by the letters alongside the different members in the drawings. For instance, ½"-.035 means half-inch diameter tubing of .035 gauge.

In building the steel fuselage, several precautions are necessary. First, you must have the right tubing in the right place. Second, the welding must be done by a man who knows how to weld. If you don't know how yourself, you can hire a welder to come to your shop. In a day or a day and a half he should be able to completely weld the fuselage together. Third, the material must be all cut to fit right to the dot and brightened up at the weld so you get a clean fit and one in which the weld is from tubing to tubing rather than filled in with welding rod too much. Given these conditions, the complete fuselage will in every way be equal to a factory job.

I will weld up these fuselages myself for

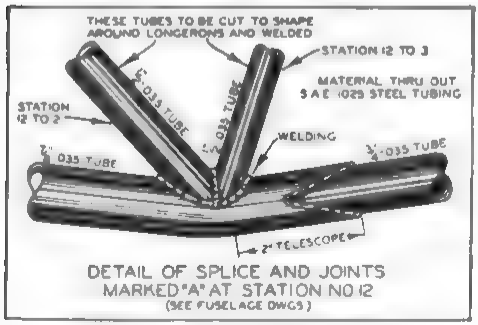


Fig. 2A. This shows method of fishtailing longerons together. Note manner in which struts "land."

MONOPLANE

You can build her for $500!

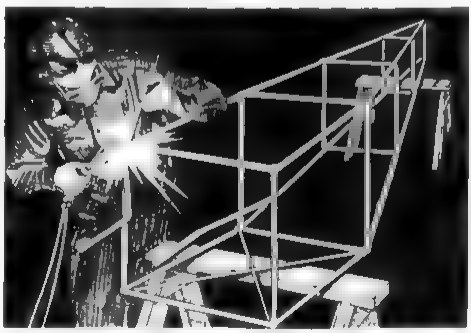
Sup er, brother, slip 'er! The Air Camper comes in to land.

Here's a view of the Pietenpol Air Camper coming in for a landing. Further photos of the ship will appear next month. It has a take-off speed of approximately 35 m.p.h., a land speed of 40, and a flying speed of 60-75 m.p.h. Stick and wire or steel tube fuselage may be used at the option of the builder. If you don't want to wait for the rest of this article, which, because of its great amount of information, must be printed in installments, you can procure a set of large blueprints for the ship at a cost of $7.50 by addressing Modern Mechanics and Inventions, Minneapolis, Minn.

anybody who wants them. I can give you a reasonable price, too. Or if I'm too busy to do it myself, I'll have a fellow weld it who knows his groceries.

The first thing to do is to lay out the sides and the top and bottom plans of the fuselage full size on a floor. Then the tubes are cut with a hack saw so that all the longerons are in place, and so that all the struts in the bays, of the right sized tubing, are in place right to the dot. Lay out the center lines and then make the center lines of the tubes coincide with the center lines of the fuselage as laid out. This assures that all the joints will hit at critical load points and that there will be no eccentric loadings on any of the tubes.

Then tack-weld each of the sides together. Then turn them bottom side up, and with the top longerons on the floor over the top view, tack in the cross members for the top. Jigs will have to be made to hold the work while you are welding it. These can be made from wood as well as not. By referring to the blueprint you can see that the cross frames run from 4 left to 11 right, and 3 left to point 12 right, and 1 left to point 14 right. All these tubes are ½"-.035 S.A.E. 1025 tubing. Figure A-1 shows how the fuselage, after being tacked, is put on a horse and welded up



The welder should work around the fuselage in a clockwise direction, starting at the fore end. This method eliminates possibility of warping.

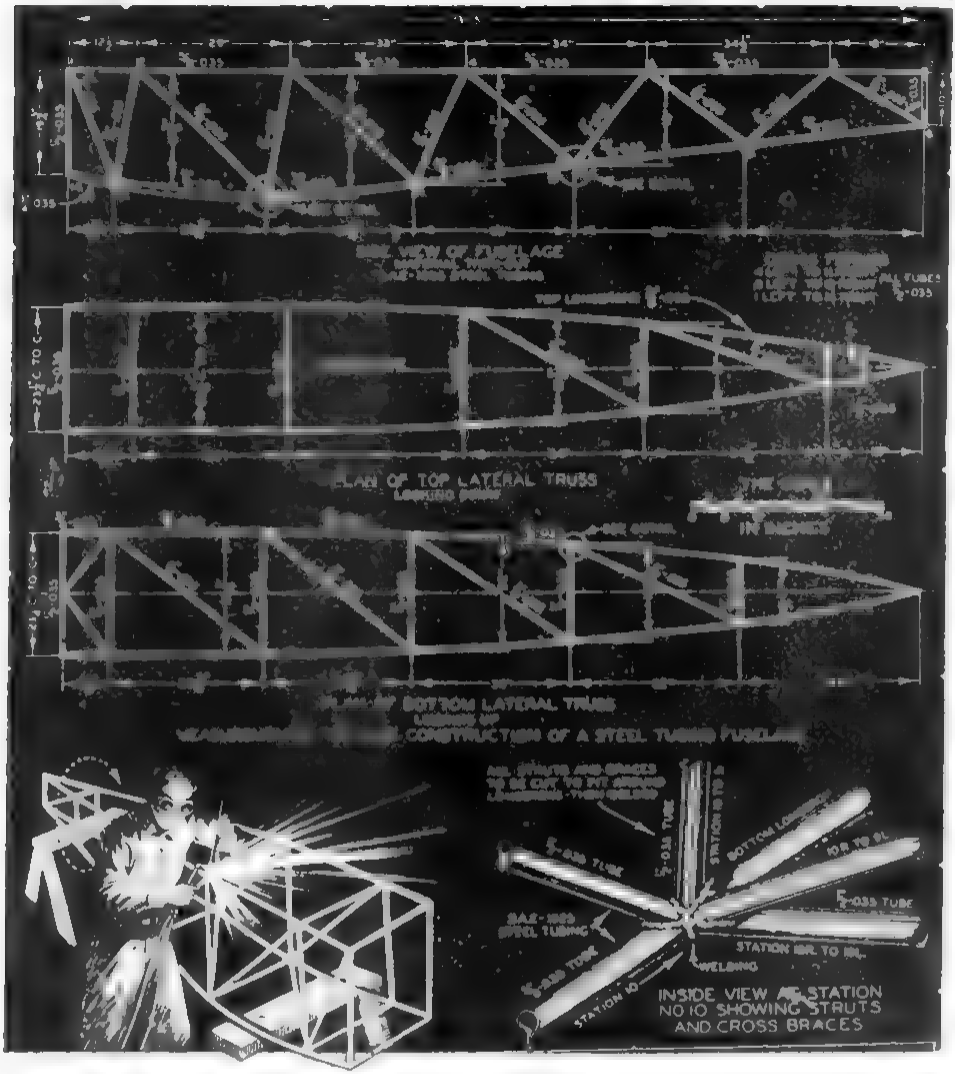


Fig. 1A. When laying out the sides and the top and bottom panels, use the center lines as ab olute guides. Note the manner in which the cross frames run. This steel fuselage has been stress-analyzed.

completely. The torch is applied joint by joint, going in a clockwise and rearwards direction.

This is done to avoid twisting. The alternate expansion and contraction of the metal would give you a badly warped fuselage if you jumped about hit and miss in your welding.

The detail of the joint at point 10 on the fuselage is shown to enable you to visualize how the weld should look.

All the dimensions are shown. It is not necessary to scale the drawing, although a scale is shown. This is more for handy reference than for anything else. Use the dimensions exactly as shown in the drawing and don't deviate a hair, or the value of the stress analysis will be thrown to the winds.

At the fore ends of the fuselage, and at 2, 3, 13 and 12 there are the fittings for the struts and the motor mount. These will be dwelt upon at a later time. They are simple

to make and are welded in place. Fig. 2-A shows the method of joining two different sizes of tubes. This is called fishtailing.

A lot of constructors have different methods of doing up the final finishing of the fuselage. After the welding has been done, leave the oxide on the steel tubes. Don't try to brighten them up with emery cloth as they'll only rust. Some fellows paint their steel stuff gray, others red, others dip it in lionoil. I like that method the best, or if it can't be dipped, as of course cannot be done by amateurs, lionoil can be painted on. It is transparent, more weatherproof than varnish, and one can see flaws as they develop. (Which isn't likely. Rust, weather, and the normal landing shocks encountered in use have little or no effect on a steel tube fuselage. Routine inspection for failure, if made after unusually hard landings, or at least twice a year, will be ample to ward off any weakness which may develop.)

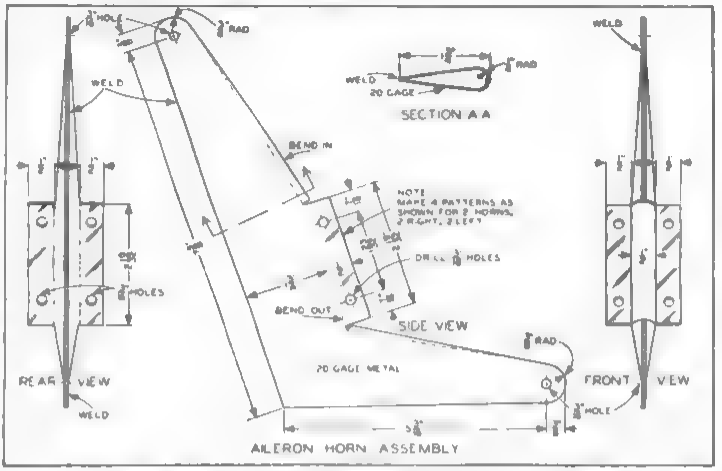
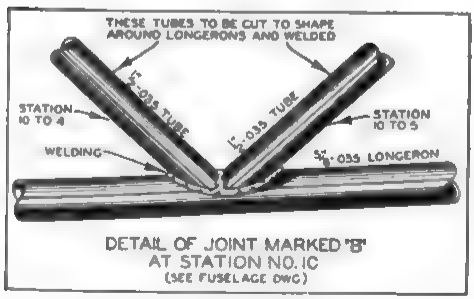


Fig. 3A.—The aileron horns, 2 required, are laid out as above drawing shows. Allow for the bend at the head face of the cross section A-A.

Aileron Fittings

But that is for the steel tube fuselage—that little talk. There were one or two fittings to be talked about—left over from the last chapter.

These were the fittings for the ailerons. You remember we were talking about the making of fittings when that last chapter came to a close.



This drawing shows the way the strut tubes "land" on the longerons. Care must be used in welding.

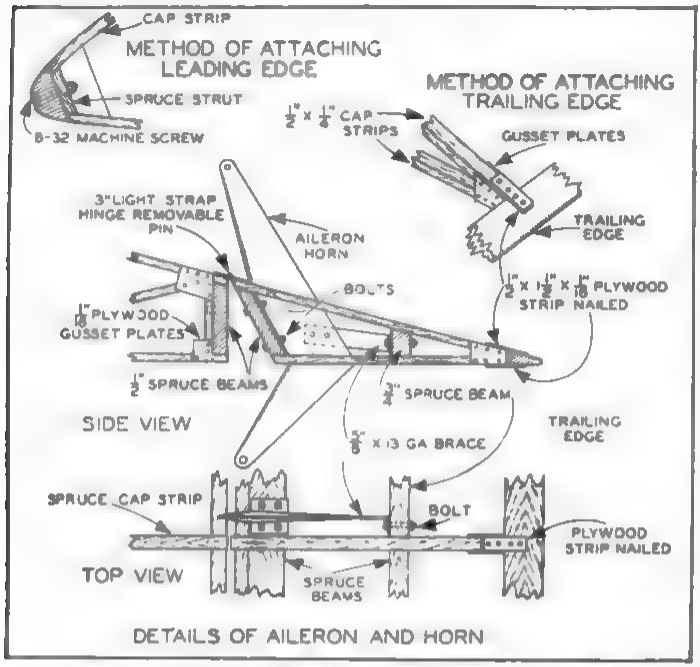
The method of attaching the horns to the aileron spar can be readily seen by reference to figs. 3-A and 4-A, when the time comes to put the wing together. Suffice it to say for the present that the horns, one for each aileron, are made of 20 gauge cold-rolled sheet, and are made with all bends cold. Never heat rolled steel in building aircraft. All of the properties of the metal go up the flue when heat is applied.

The dimensions of the horns are easily seen. The side view in fig. 3-A is made in duplicate, and enough stock allowed for a gentle bending curve along its fore-edge. It is welded at the rear, and the section at a-a then becomes as shown in the drawing. These horns, two required, should be made accurately when the metal parts for the ship (which are the hardest, and which should be done first if you want to avoid discouragement in building the ship) are done up together.

A reinforcing strip which adds to the stiffness of the aileron more than anything else, is run from the ½" spruce aileron spar back to the spruce ¾" member in the aileron. There it is fastened with bolts as the drawing, fig. 4-A, shows. In this drawing you will find the methods of attaching the leading and trailing edges of the wings. Good point to remember when building the wings, which step we come to next.

Fig. 5-A shows the wing curve I use. I

Showing How the Aileron Is Attached to the Spar



Here is Fig. 4A and on the opposite page is a drawing of the wing. This shows the wing horn anchorages and the wing construction. Note the hinged flap at the rear of the wing in the opposite page, to admit pilot.

don't know what to call it. I made it up myself after building a lot of wings. It has proven to be the best curve I can find for the ship. I started out with a Goettingen 387, but I couldn't lift hen feathers with that wing. It was light, and the ship weighed just the same, but it took a long time to get off the ground, and climbed slowly, so I junked it.

Now I'm a practical man. I don't know mathematics much—enough to figure out the major loadings, wing areas, and so on, but as far as saying "hocus pocus" to a Reynolds' number and having a wing coefficient pop out at me, I'll have to excuse myself. What engineering ability I may have is a result of lifelong skill at doing machine work. Westy Farmer tells me the best engineers are the fellows who graduated from the School of Hard Knocks, and I guess he's right. Somehow a fellow gets a sense of proportion about what is strong enough, and what isn't, by merely being around well engineered work all his life. Anyway this wing question didn't worry me any.

I knew that the centers of pressure in a parasol type of plane couldn't shift any more than enough to make the ship slightly nose heavy or slightly tail heavy on trials, and that when I had found out where the centers of lift were I could place them ahead or behind a little at a time until I had a flyin' sweetheart, as Andy says.

So all I worried about was getting a section with a good lift coefficient, and I didn't worry about the bugaboo of that dreadful name, either because I knew when I had hit the section that gave the best all around performance and carried the biggest load, why, the lift coefficient had to be good. As long as it was there and as long as I knew it was there, that's all I wanted to worry about. *Where* it was and how much didn't bother me. So we built up a bunch of wings, and flew them. The spar depth varied in all of them. I tried Clark Y, and a lot of others, but the section that outshone all the others is the one shown in fig. 5-A. Don Finke, a neighbor who flies as though he were born in a plane, and myself sketched it out one night out of our heads, and when we tried it we found we had a curve that was about as fast as the best of them, but would lift two people like a balloon, whereas others we had tried wouldn't get two people off without a long run.

I am told by Farm-

BLUEPRINTS

A large set of shop blueprints, showing necessary details of construction of the Pietenpol Air Camper, can be obtained from Modern Mechanics and Inventions, Minneapolis, Minn., for $7.50. How the Ford motor is converted, how the wing is built, the fuselage made, and the various fittings fabricated, are all shown clearly in the blueprints, which are shipped postpaid.

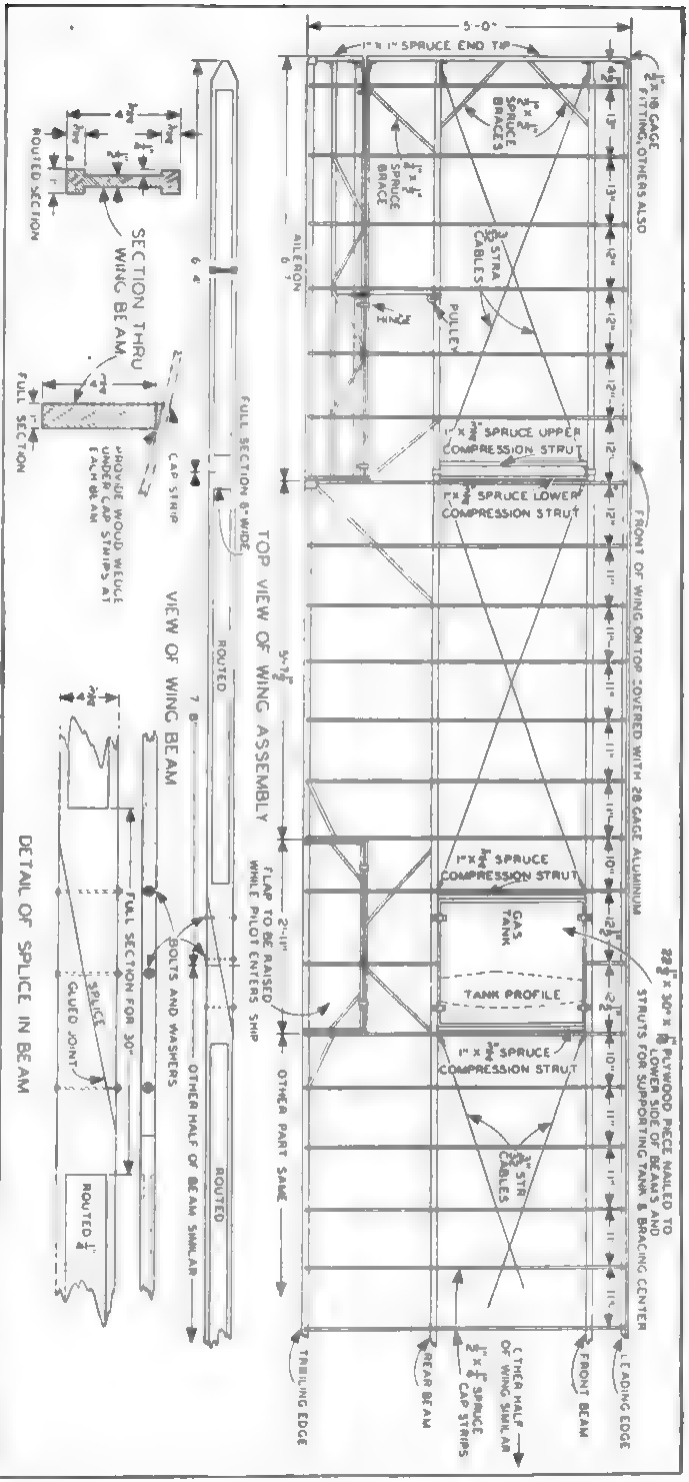
er that the curve is practically an Eiffel 36, with ordinates increased 25% all along the chord. Westy has all the dope at his fingertips, so he must be right. If so, that may account for the phenomenal performance and stability of this curve. Eiffel was a good engineer too, y'know. The Eiffel 36 was the curve used by the Curtiss Jennies.

The spar in the wing plan we finally used as being best and stoutest is shown in the large drawing of the wing. These spars handle a load directly proportional to the load of a Swallow TP spar. Each is slightly larger than a TP spar. We wanted to have the wing stress analysed, but when Prof. Wise, who engineered the Mohawk ship analyses, took a look at the wing, he said, "Plenty strong! No need to go through any analysis on that job, unless you want to save weight."

And we didn't want to do that because the ship flew like a homesick angel anyway, and for cross-country work—which we have done a lot of—we wanted her husky to the point of ruggedness. That she is as shown.

The spars, dimensioned 4¾" by 1", are spliced at the middle. The method of making the joint is shown. The fayed surfaces of the spars are carefully matched and the casein cold-water glue stuck on as described last month.

The three bolts of 3/16" nickel steel with



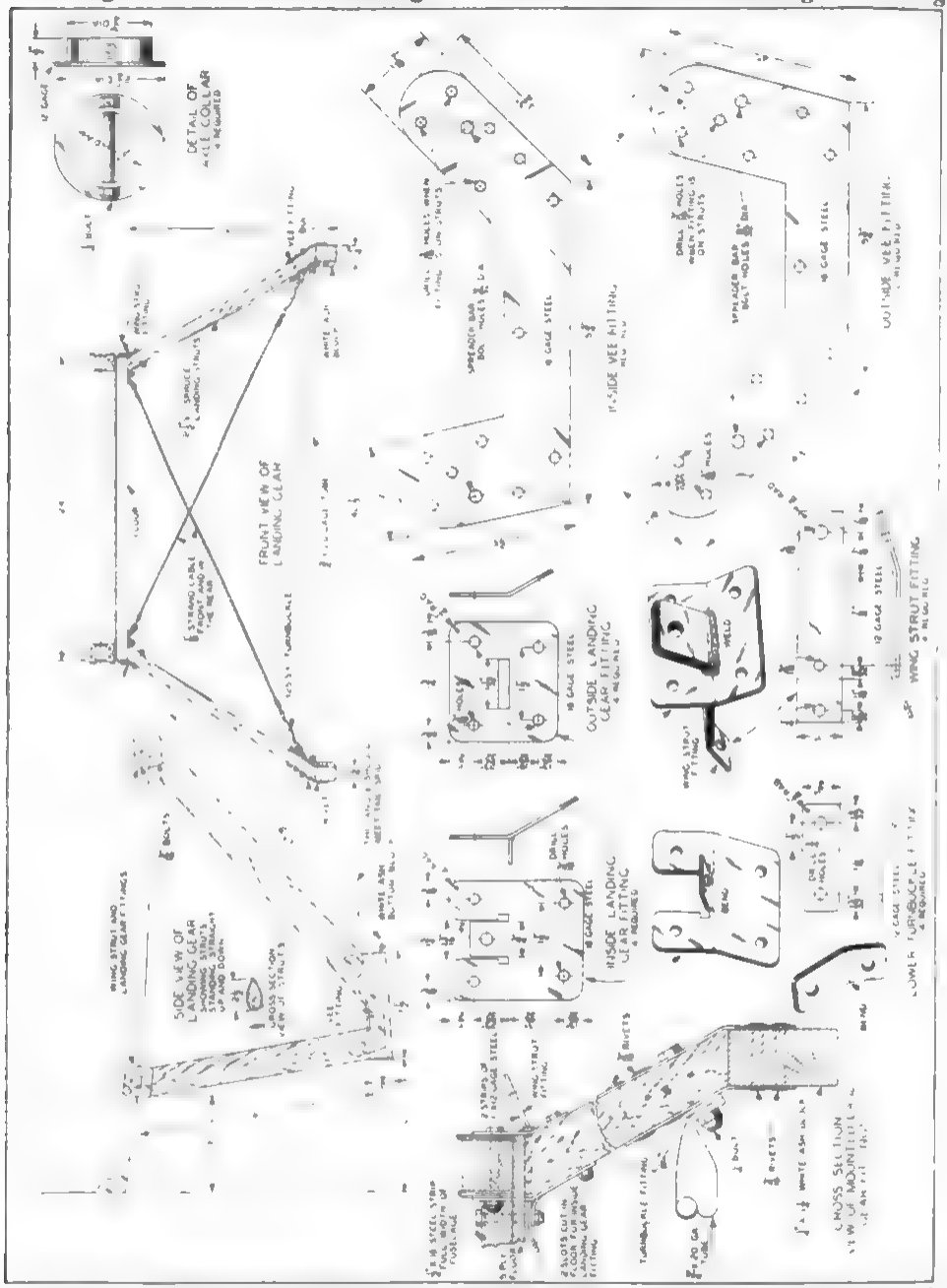
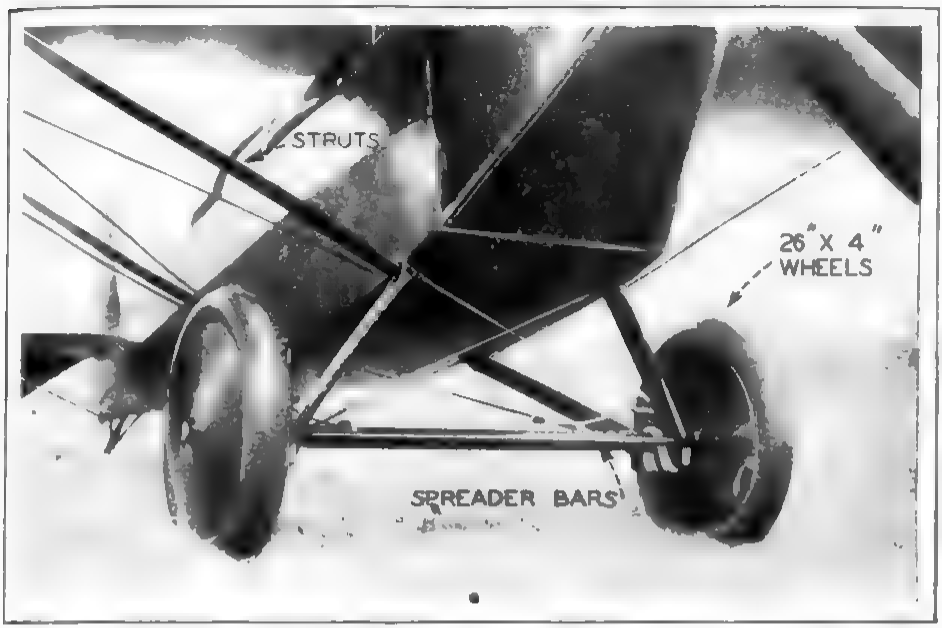


Fig. 6A. Here are all the details of the landing carriage. The fastenings, the fittings and the method of their attachment are all carefully detailed. All fittings are of cold rolled sheet steel, cold worked.

washers are sunk home through drilled holes. No need to take them up any tighter than to just make them sink the washers home even with the surface of the wood.

The spars, of spruce, of not less than 3 annular rings to the inch, are routed as the



By looking at this photograph and comparing it with the drawing on the opposite page the component parts of the undercarriage can readily be seen. It has stood the severe test of long service.

drawing shows. This routing is done to save a little weight, and I have a feeling it makes a spar a little stiffer, inasmuch as it gives it an I-beam section it wouldn't have otherwise. This routing must be done carefully, making sure that the rabbeting plane (Stanley—all hardware stores) doesn't chisel in under the grain. The corners should not be as sharp as the section in the drawing shows, either. It would be better to work in a little fillet.

Both front and rear spars are alike.

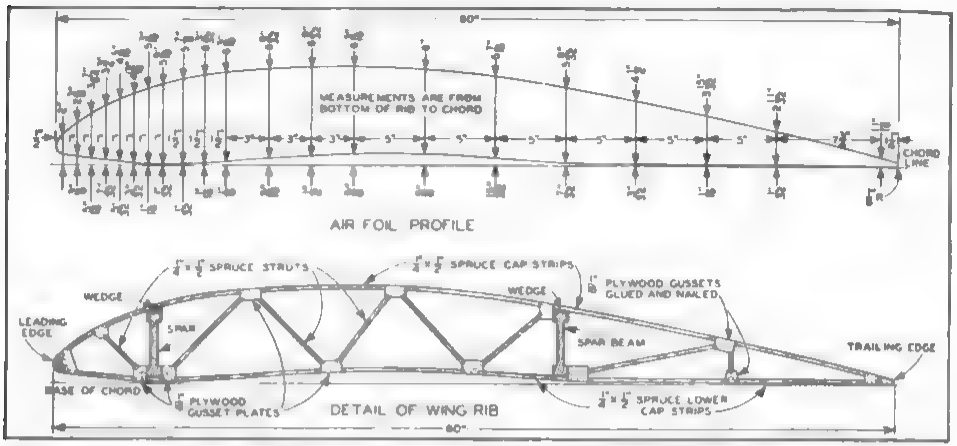
The slanted openings are filled with cork wedges or spruce wedges where the wing ribs cross the spars. They are fastened in with casein glue. If you use nails to fasten the ribs to the spars, make them light brads and fasten them in near the edge. The function of nails in this usage is not to add strength. It is to hold the ribs in place, and if you drive the nails through the center of the rib, you run the risk of making the cross section smaller just at the point where you need all the strength.

The wing ribs themselves are made up in the usual manner with a template or jig. These ribs are exceptionally strong and heavy. The capstrips are of ½ x ½ spruce and the struts are of the same material, the plywood gusset plates of 1/16" 3 ply Haskelite or similar plywood. Light nails and casein glue hold them in place. You will need 28 ribs. This rib making job, after the metal fittings have been made, is the most tedious job about the whole ship.

Just one little correction while I am at it. The drawing at figure 5-A shows a dimension of 6" in the top center of the wing section just a little below and to the left of the figure 60". See it? It's wrong. Should read 6⅛" instead. Just thought I'd mention it to make Andy's work lighter. Some of you fellows in laying the curve out full size might take the drawing literally and build a set of ribs with a bump in 'em. The idea of the dimensions is to enable you to get an approximate outline and then fair it up with a thin batten to give you your master wing curve.

The drift bracing and the fitting on the wing come at a later date. Suffice it to say for the present the 3/32" stranded cable is anchored to the clips to be shown in the next and last installment. By the way, in this connection, if any of you hombres are figurin' as how you'll be buildin' one of these cloud hoppers, better get a set of prints.

Here's the Special Wing Rib Developed for the Ship by Mr. Pietenpol



This is Fig. 5A, and shows the Pietenpol wing curve, which is the result of long experimentation on the part of the builder of the ship. The gusset plates and capstrips are very heavy.

It'll enable you to grasp the big idea much better than getting it piecemeal the way I have to present it here. Address MODERN MECHANICS AND INVENTIONS, 529 South Seventh Street, Minneapolis, Minn., enclosing $7.50, and telling 'em you want a set of large blueprints for the Pietenpol Air Camper.

The wings are built up the regular way. Spars built first (no dihedral, Clotilde) and then the fittings fitted, slipped off and the ribs slipped on, then the cap and trailing edges fitted, and then the fittings, the tank, the drag bracing, and finally the pillowslip covering of grade A muslin for a cover.

In doping the wing, after the sack has been sewed to fit, and has been sewed to the wing, the edges along the ribs and the leading edge are doped with a good grade of nitrate dope. When this first doping has dried the next may be put on all over the surface of the wing. At the end of the second or third coat of dope the pinked edging is coated on and one or two more coats will finish the job. The first two or three coats of dope will not do much more than barely tighten up the cloth. The first coat will leave the covering smooth, the second will tighten that up somewhat and make it easier to put on the second coat of the stuff, where the third will leave the surface rather drum taut. At least an hour or two on good sunny days, and maybe even a day or two during damp weather should be allowed to slip by as a drying interval.

Now for the coloring of the wings. Some will like to use aluminum or bronze powder sprinkled into the dope on the last two coats. (More than five coats of dope should never be used on a wing as it sets up unusual strain on the surface.) Others will want to use paint. I used an orange paint on the ship you see in the photo of the undercarriage, and it worked well when half varnish was added. Just take a glossy paint and add half varnish and a little drier until you have a normally thin mixture, and brush it on. It will need a lot of time for drying, though.

The Air Camper is ideal for cross-country trips for two!

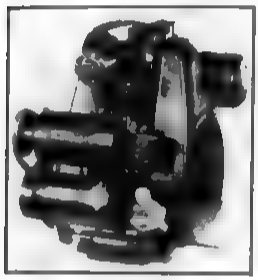
Part III of this great article will appear next month.

Coin-in-Slot Store Delivers Groceries Wrapped and Tied

NOW you can get your groceries by depositing a coin in a slot machine, in the same way that cigarettes and chewing gum have long been automatically vended. The automatic grocery store is called the "Delamat" by N. Robert Harvey, its inventor, who is shown in the photo at the right pointing out the endless chain mechanism by which canned goods are lifted within reach of the purchaser when a coin is dropped. Display windows enable the customer to see what he is purchasing at all times. Inventor Harvey spent three years in perfecting this most modern of stores. Electricity is used to operate the mechanism.

N. Robert Harvey, inventor of the coin-in-the-slot grocery, points out its endless chain mechanism.

Automatic Gas-Engine Starter



New gasoline engine starter operates automatically.

AUTOMATIC self-starting equipment for gasoline motors used on portable refrigerating plants and other units where the usual automatic starting electric motor cannot conveniently be used, is provided in the new unit shown above. When air pressure or some other pertinent factor drops below standard, this device immediately starts the gasoline motor.

Many Uses of Milk in Industry

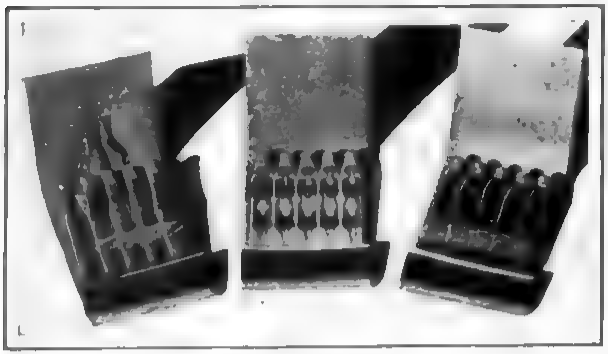
BUTTONS, combs, and fountain pens are manufactured from casein, a by-product of milk which is the principal constituent of cheese. Coated printing paper makes use of casein to bind the smooth clay surface to the paper, and it is this substance which sometimes imparts a sour odor to the paper.

DeLuxe Railway Coaches Have Individual Swivel Seats, Large Windows

SEVERAL steel passenger coaches recently delivered to the Boston & Maine Railroad represent the last word in day-coach luxury. Instead of the usual 88-person capacity, these coaches seat only 68 passengers, each of whom has an individual seat luxuriously upholstered in mohair and provided with double inner-spring cushions. The chairs may be revolved on a swivel arrangement, and the backs tilted according to the desire of the occupant. Car windows are 32 inches wide and provided with an adjustable ventilator at the bottom of the sash. Heating is automatically controlled by a thermostat.

Luxury for day-coach passengers is provided in this new type car in which the seats move on swivels, have adjustable backs, and are upholstered in mohair with deep spring cushions.

Paper Matches Made in the Shape of Advertiser's Product



Here we have three match boxes with the paper matches in the various shapes of the products that they are to advertise.

A LARGE American match manufacturer has recently advanced an idea which will greatly increase the advertising value of its product. These small books of paper matches which are commonly given away when you purchase your smokes are the basis of the idea.

Instead of the ordinary paper lucifers, the matches are shaped like the article which they advertise. The stunt has its limits, however, as bass drums and pretzels will be hard to imitate with match sticks.

Eight Rules for Taking Baths

TO HELP stop the rapidly increasing number of bathroom accidents, eight rules were recently presented by the New Health Society of England.

The first rule is always keep the window open a little to prevent poisoning from a defective heater. The second and third are never to take a hot bath after a heavy meal nor a cold bath if you have a weak heart. Fourth is to have all heaters equipped with safety devices, so that steam filled pipes cannot burst. The other rules deal with electric fittings in the bathroom, it being agreed that electric shocks are both common and fatal when the skin is wet or when the bather is in a metal tub electrically connected to the ground by the water pipes.

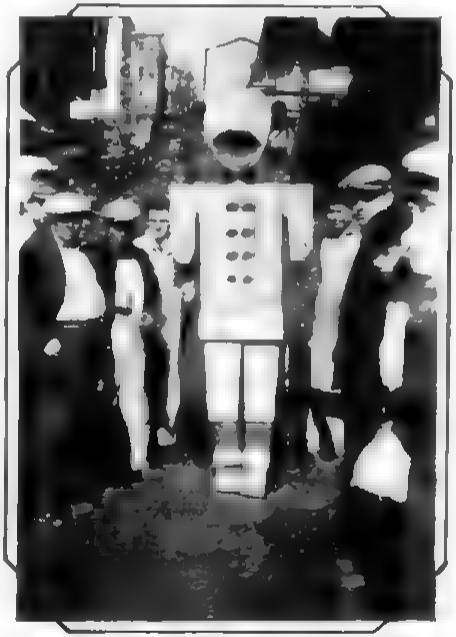
Manipulating Case Strops Razor

This automatic stropper also serves as a rust-proof container for the blades.

IT IS only necessary to open and close this stropper half a dozen times and the blade is resharpened. When the case is opened and shut a gear pushes the blade against four whirling leather discs so that the edge is given a thorough stropping.

The leather discs revolve in castor oil, rust-proofing the blades.

Mechanical Man Amazes 'Frisco



Mr. Robot is shown paying an informal visit to San Francisco's Chinatown for publicity purposes.

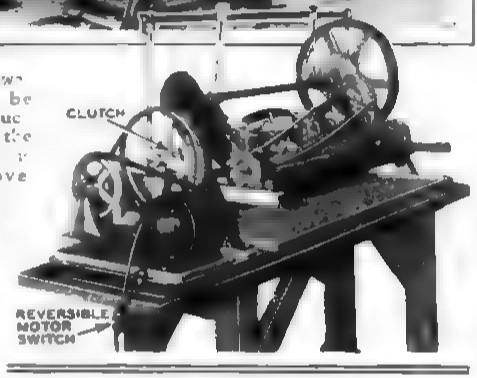
A MECHANICAL man almost nine feet tall is frequently seen parading the streets of San Francisco. He talks, he walks, he sings songs, and he tells amazed pedestrians all about the local movie shows.

This robot, however, is all a delusion and a snare. In truth, he is not a robot at all, but a real man all dressed up in a metal suit, who "talks" through a big loud speaker mouth.

New Sharpener Whets Mowers Without Removal of Blades

A PRACTICAL machine for sharpening all kinds of hand and power lawn mowers without the use of grinding wheels, has recently been developed by manufacturers. The principle of the new sharpening system is unlike any other lawn mower sharpener, as it sharpens all the blades and the cutter bar together, assuring perfect contact of the blades and the cutter bar across the entire width of the mower. The machine, shown in the photos at the right, is very simple to adjust, and after the mower has been set, it sharpens automatically. It is very easy to turn out perfectly sharpened lawn mowers in from 15 to 20 minutes.

The new lawn mower sharpener can be mounted on a truck and powered by the motor of the car, as demonstrated above



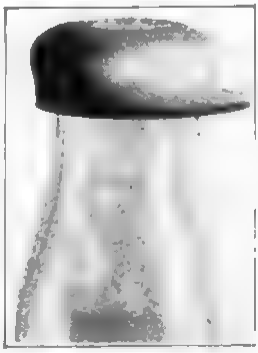
The Foley Electrakeen Sharpener, shown above, sharpens all the blades and the cutter bar together, doing the work in fifteen to twenty minutes.

The sharpening device is suitable for either a portable shop, as demonstrated in the accompanying photo, where it is operated from a gasoline engine, or it can be set up permanently in a shop and operated with an electric motor. In either case, the cost of sharpening lawn mowers is practically nothing, as it costs less than one cent each for both electricity and material.

The Foley Electrakeen System, as the device is called, is very popular for custom lawn mower sharpening.

Sanitary Cap for Milk Bottles

A RUBBER cap now on the market fits tightly over milk bottles and keeps the contents clean and free from germs. The cap is sterilized by boiling and keeps the rim of the bottle clean and the milk or cream free from ice-box odors and prevents loss of contents if the bottle is tipped over.



This new sterilized cap fits over bottle and keeps milk clean and free from odors.

Cheap City Gardens Under Glass

BACKYARD gardens to provide ornamental plants or hot-house vegetables in early spring are possible, even in cities, through use of the familiar seed starting device which consists of a frame of wood or other material, usually with its top a few inches above the ground, and covered with a glass window like the roof of a greenhouse. The bottom of this frame may be the ordinary soil or may be a special soil bed containing increased amounts of fertilizers. The glass top allows the heat rays of winter or spring sunlight to enter and keeps much of this heat inside, just as a greenhouse does. Meanwhile the sides of the frame, preferably made of thick planks or insulated by layers of felt or similar material, keep out the cold winds and help to retain the captured solar heat. Extra heat may be provided, also, by electric lamps inside the frames, although very little artificial warmth is required.

Catching BIG FISH

Near the end of a two-hour battle. Willis A. Rowe is seen here fishing from a 16-ft. outboard powered boat, with a 200-pound black sea bass ready for the gaff.

Two fish that had to be towed ashore after being caught. They are sea bass weighing 200 and 215 pounds, and were taken in a fourteen-foot boat.

Everybody loves to tell a fish story, but how many can back up their boast of the one that didn't get away with photos such as these? Here is a yarn of a sport more thrilling than tiger hunting.

A SPORT demanding great skill, and fraught with adventures paralleling those of the ancient boatmen who went down to the sea in skiffs in quest of whales, has recently come into being among sportsmen of the Pacific Coast. These fellows have scorned the use of big boats and heavy tackle for catching big fish, and have transferred rod and reel methods of deep sea angling sport to the smallest possible boats.

A lively contest now ensues, the objective of which is to see who can catch the biggest fish from the smallest boat. Records are being made and broken. Fish of 250 to 400 pounds have been taken with rod and reel and towed ashore with boats weighing less than the fish, and powered with the tiniest of outboard motors. There are bigger fish in the seas and it is impossible to even predict at what point the conquest will end in the

from Small Boats

by JOHN EDWIN HOGG

battle between big fish and anglers in small boats.

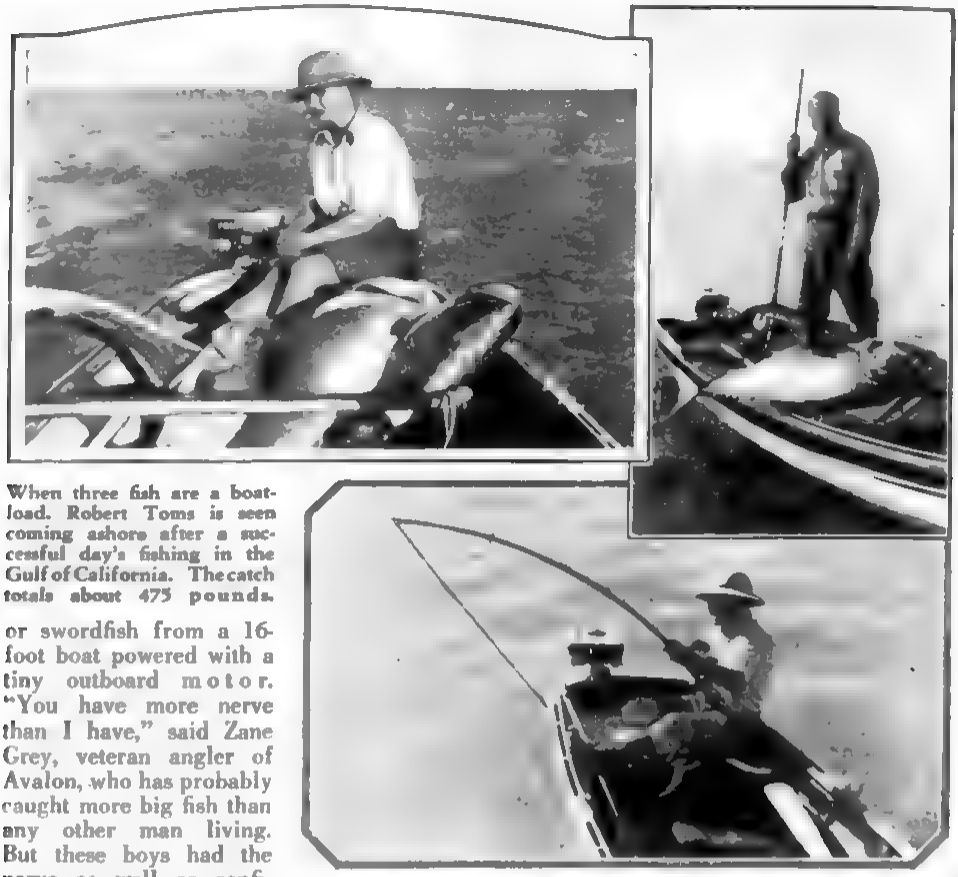
For many years the arbiter of the sport has been the Tuna Club, of Avalon, on Santa Catalina Island, California. The Tuna Club has established rules designed to put sport and skill into deep sea angling. Sportsmanship dictates that the largest of game fish can be taken with rod and reel. The reel must not carry more than 500 yards of line, and the line used cannot have a breaking strain in excess of a direct pull of 36 pounds. Tuna, swordfish, black sea bass, and other fishes three and four hundred pounds in weight have been taken on such tackle. The chap who fishes with a nine-inch hook and a thousand feet of line resembling a window sash cord is regarded as a market fisherman, and *not* a sportsman. To be classed as a sportsman eligible for membership in the Tuna Club the angler must have taken a fish of designated size for the various species upon regulation tackle.

"It can't be done!" said certain skeptics when two enthusiastic Los Angeles anglers "put-putted" across the 28 miles of the shark-infested, and boisterous waters of the Santa Catalina Channel, put into Avalon, and announced their intention of catching a tuna

Sometimes it's a job to get him after you've got him! The angler weighs 180 pounds and his fish 200. The catch was finally hauled aboard over the stern of the boat.

The author with a 200-pound black sea bass which was caught from a 16-foot boat. This fish had to be tied up and towed ashore with a motor-boat.

Landing 200-Pounders With Light Rod and Reel Is Real He-Man Sport



When three fish are a boat-load. Robert Toms is seen coming ashore after a successful day's fishing in the Gulf of California. The catch totals about 475 pounds.

Nearing the end of a two-hour fight. A 200-pound fish was directly under the boat when the photo was made. Above is a 150-pound tuna.

or swordfish from a 16-foot boat powered with a tiny outboard motor. "You have more nerve than I have," said Zane Grey, veteran angler of Avalon, who has probably caught more big fish than any other man living. But these boys had the nerve as well as confidence in their idea. They "put-putted" around the south end of Santa Catalina Island, and five miles off shore where the waves roll across the Pacific from China, they hooked onto a 130-pound tuna.

Anyone who has ever caught a two-pound trout on a fly rod knows something about the fight a fish makes for his life. Multiply a 2-pound trout sixty times, and it's the equivalent of a 130-pound tuna. Play such a fish for an hour and forty-five minutes with rod and reel from a 16-foot boat that dances up and down over blue-green mountains of water, and you have a real sporting adventure.

A tuna that has fought the spring of the rod and the break of the reel for nearly two hours still has a lot of fight left in him. About the time one thinks he's ready to be gaffed and clubbed to death, Mr. Tuna makes a rush at the sky, takes the air over the top of the boat, and pulls another 40 yards of line off the reel. Eventually he is brought to gaff, and the anglers find he's too big and heavy to be hauled in over the gunwale of their small boat. They point the bow of the boat into the wind, heave out a sea anchor, remove the outboard motor, and drag the fish aboard over the stern.

A second pair of small boat anglers set out to break the record of the first pair, and they land a tuna of 160 pounds. Another angler breaks the second record with a 175 pound swordfish, and that record goes down to an angler in a 14-foot dinghy and an outboard motor who comes ashore with a 200-pound black sea bass towing astern. The fish was so big and heavy, and the sea was

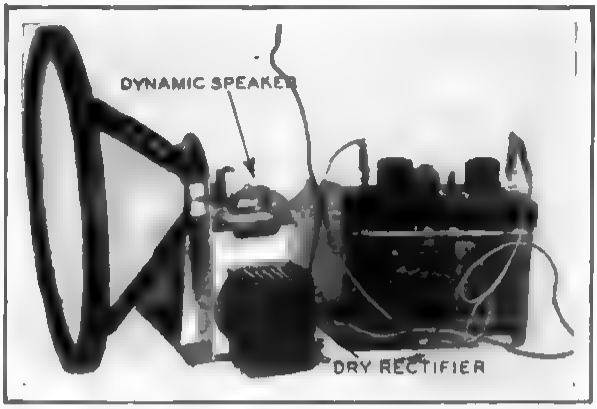
(Continued on page 208)

Dynamic Speaker Charges Batteries

by

L. B. ROBBINS

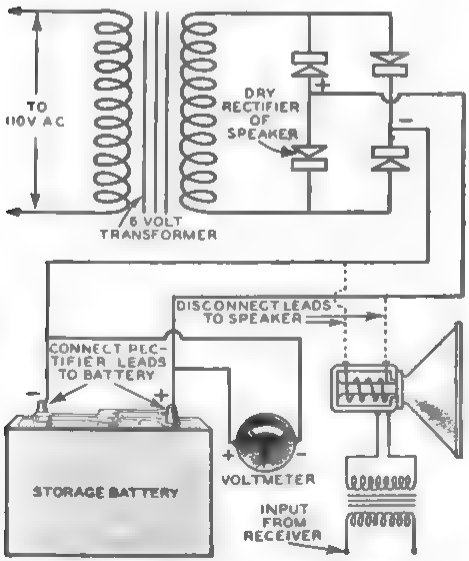
Both radio amateurs and broadcast listeners who build their own sets will find the plans and ideas offered in this "Sparks from the Radio Editor" department of considerable interest this month. By rigging up the rectifier or the combination volt-milliammeter, the two chief projects, you can save yourself considerable expense.



Hooked to the storage battery as shown, the dry rectifier of the dynamic speaker will charge at a rate of one ampere per hour.

IF YOU have no battery charger available with which to boost your "A" storage battery, then you can use your dynamic speaker for the purpose, providing it is furnished with a dry rectifier for the field coils.

Most dynamic speaker rectifiers deliver from 6 to 15 volts of pulsating DC current which is absolutely OK for battery charging, though somewhat slow due to the low current output, which seldom goes over one ampere. Yet, this will charge a 4 to 6 volt battery in time and certainly is better than having no battery charger at all.



Leads to speaker field coils are disconnected and hooked to the terminals of the battery as shown.

The circuit for the charger is shown at the left below. Disconnect the wires leading from the rectifier to the speaker field as shown by the dotted lines in the sketch. Then, testing with a voltmeter for polarity, connect the plus wire from the rectifier to the plus post of the battery, and connect the minus wire of the rectifier to the minus post of the battery. Plug the rectifier into the light line and let it charge.

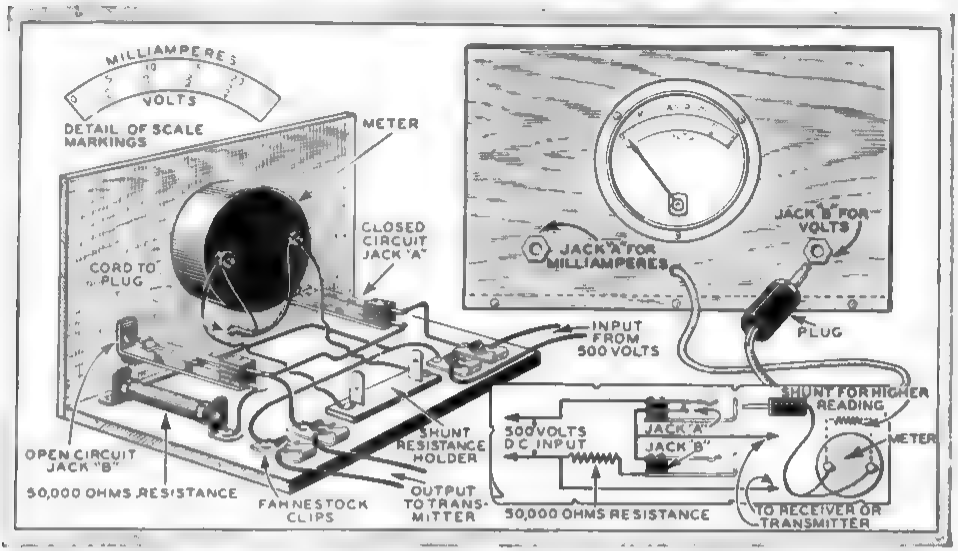
For the usual 100 ampere storage battery, it will, of course, require somewhat over 100 hours to bring it up from a "flat" condition to "full charge." But as the 4 volt battery is usually not over 50 to 60 ampere hour capacity, half that time will suffice.

250 Workers Handle Radio Program

TO THE listener-in the coast-to-coast broadcast program personnel comprises the performers, the network announcer and the local announcer. Actually, however, there are hundreds of workers engaged in handling the program.

On large networks including over 10,000 miles of telephone line carrying programs, over 250 trained men are stationed at some 100 repeater stations and at main control points. The system is duplicated by a second monitoring or telegraph system throughout so that when the usual coast-to-coast network is in operation, more than 20,000 miles of line are employed, to say nothing of alternate lines kept ready for emergency use.

Old Auto Meter Makes Combination Volt-Milliammeter



In making the combination volt- and milliammeter, the old auto ammeter is mounted on the panel and wired up with other parts as shown above. The scale must be re-calibrated to read as illustrated.

VOLTMETERS and milliammeters for use on radio transmitting sets are costly, but the set builder or experimenter who wants to can turn out at small cost quite a serviceable combination voltmeter and milliammeter that will give fairly accurate DC readings.

First, obtain an old style dashboard ammeter of the type used on old Packard, Peerless, or other such high grade cars. These ammeters were of excellent quality and can be picked up at a junk yard for a small cost. The cheap style found on many present day cars will not do.

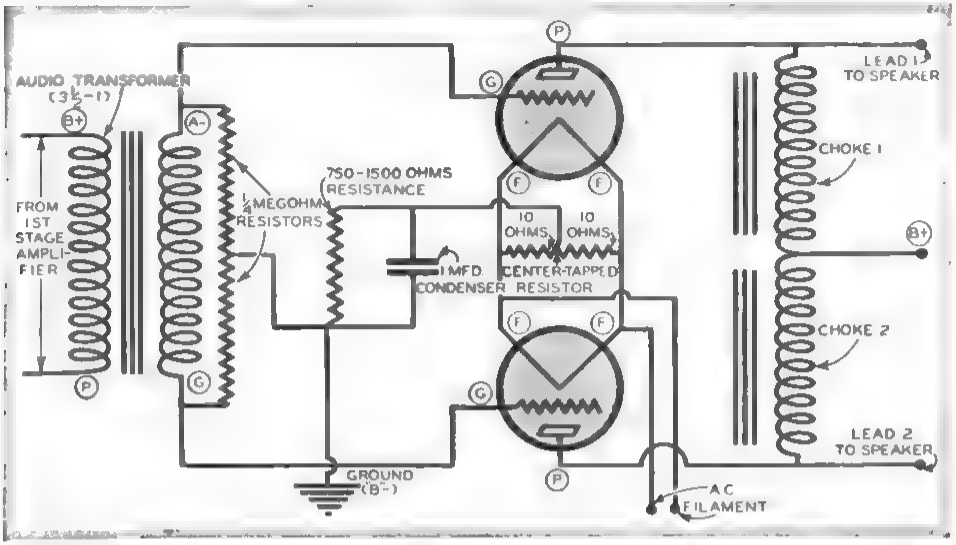
Across the two binding posts, on the inside of the meter will be found a shunt of heavy wire which should be removed. This converts the ammeter into a milliammeter, which should then be calibrated as follows: Connect a six-volt storage battery in series with a thousand ohm resistor and the meter. By ohms law, the current then flowing will be .006 ampere or 6 milliamperes. Mark this point on the dial of the meter. Then, other proportional points on the dial will be multiples of this current. If, for instance, the 6 milliamperes came on the 5 of the dial, then 10 would mean 12 mils. 15 would indicate 18 mils and so on. So using this 6 mil reading as a basis, draw a new scale under the old one for reading milliamperes, as shown in the drawing at the top of the page.

For voltmeter readings, say from 0 to 500 volts, put a 50,000 ohm variable resistance in series with the meter. Then, putting 100 volts on the circuit, the needle should stop at the 5 mark on the old scale. If it stops at either side turn the resistance up or down until the needle rests exactly on the number. Mark this 100 volts, and so on across the scale in steps of 100. By doubling this resistance, of course, the meter will read up to 1000 volts. In fact any voltage reading can be obtained according to the resistance inserted.

A neat little arrangement for the meter is shown in the drawing above. Likewise the circuit. The meter is mounted in a small panel. Directly back of the meter is the milliammeter auxiliary shunt resistance holder, and in the panel are two jacks—"A," which is a closed circuit jack for milliampere readings; and jack "B" which is an open circuit jack for voltage readings. A double cord and plug connect directly to meter. With wiring arranged as indicated, the outfit is complete.

The output to receiver or transmitter is connected to the right hand terminals and the input from high power DC source to the left hand terminals. Then, by putting the plug in either jack, milliamperes or volts can be instantly read. A high resistance shunt across the meter terminals will increase voltage and milliampere readings.

A Push-Pull Amplifier Without Push-Pull Transformers



Wiring diagram for push-pull amplifier with filament type tubes is given above. A center tap on the imput transformer is provided by the two ¼ megohm resistors. Ford coil primaries serve as chokes.

PUSH-PULL amplification is slowly coming back into favor because of its ability to handle heavy loads and deliver them to the speaker without the use of tubes requiring extremely high plate currents. Consequently many fans are desirous of installing an amplifier of the push-pull type, but do not feel like spending the money for the special transformers required. Here, however, is a method of getting around it which will deliver a nice, undistorted tone to the speaker. This method can be utilized with heater type tubes as well as with the common filament type.

The imput transformer can be any ordinary audio transformer of good quality, preferably with about 3½ to 1 ratio. The primary is wired up in the ordinary manner, but the secondary is provided with a false center tap created by using two ordinary ¼ megohm grid leaks or resistors, as shown in the wiring diagram above.

The inside ends are connected together as shown and the outside ends connected to the "A" and "G" posts of the transformer secondary.

The output arrangements consist of two chokes—choke 1 and choke 2. Their inside ends are connected together to form the center tap leading to "B plus." Such chokes can be anything handy, such as two old audio transformer primaries, output chokes, filter chokes or any iron core chokes of approximately 30 Henries. Even two Ford coil primaries will do nicely. The main point is: be sure the chokes used are as well matched in characteristics as possible.

In wiring up an amplifier using filament type tubes, connect the filaments together and connect the imput filament voltage to them in parallel. Then center tap the filament line by means of a resistor of about 20 ohms—10 ohms on each side—as illustrated in the drawing. Next, place a resistor for the bias in series with this filament center tap and the imput transformer center tap. This resistor should have a value of between 750 and 1500 ohms, depending upon the bias necessary for the type of tube used. The shunt this resistor with a 1 mfd. condenser, and ground as shown on a "B minus" post. "A minus" and "G" terminals of the imput transformer are connected to grids of tubes, and the outside choke ends of the output are connected to the plates of tubes and to the speaker.

In using this arrangement with heater type tubes, such as the 227, connect the filament circuit as before, but without center-tapping. Connect the cathodes of the tubes together, and place the 750-1500 ohm resistor and shunt condenser in series with them and the transformer center tap and ground as shown in above drawing.

Bait Cannot Escape From These Spring-Top Containers

Above is the Cant-S-Cape frog and bait box with the lunch-box handle.

Here is the convenient belt bait box, while at the upper right is shown the new, convenient floating minnow and bait bucket.

SPRING tops that allow the hand or finger to be inserted freely and then close automatically and instantly when the fingers are withdrawn are a novel feature of several different types of bait containers now on the market.

A belt bait box with this spring-top feature is especially suitable for grasshoppers, worms and all insect bait, while a belt attachment makes it easy to fasten the container on, and detach from, one's belt. Another box is especially designed for holding frogs. A minnow bait bucket with the same "spring" feature is obtainable in either floating or non-floating types. The air-tight float is made of one-piece galvanized iron soldered to an inner bucket. The float causes the inner pail to stay about one and one-half inches above the water line. Because the float is cone-shaped and placed in the bucket at an angle, splashing, when carrying the bucket, is reduced to a minimum.

The non-floating type is used chiefly for still fishing from docks and shore. The metal sides are perforated with small holes to admit air, yet not large enough for bait to crawl out. Some fishermen place the bucket down in the water to attract the fish and thus increase the catch.

Building Shaped Like Pumpkin

SOUTHERN California can boast of something else besides its justly famous climate and equally noted movie colony. It can also claim the world's title for unique architecture.

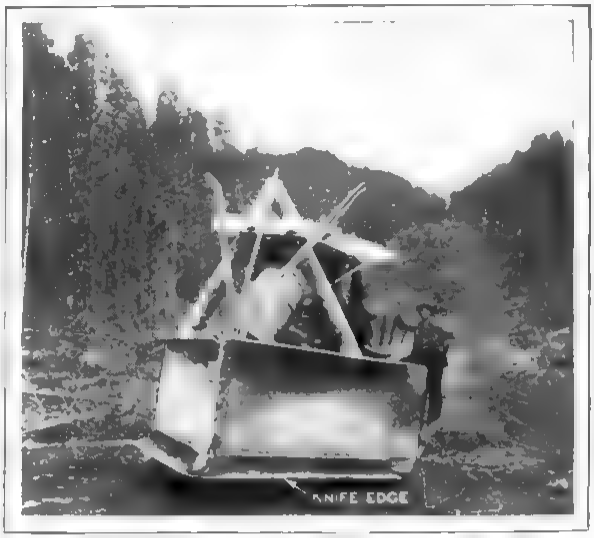
Usually these oddly designed buildings give a clue to the business conducted within their respective walls, but we'll leave you to figure out the connection between a pumpkin and the insurance business, for that is the type of business conducted in this delectable giant autumn vegetable, erected at Magnolia Park, Calif.

If the building housed a stock-selling corporation we might deduce that the owners planned to cut the pie; if the depression was over we might look upon it as a Thanksgiving memorial; but as things are, we're stumped.

An autumn delicacy has found fruit in the design of this building which houses an insurance agency in California.

Tractor With Projecting Knife Edge Cuts Away Brush

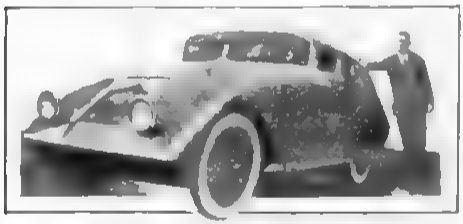
A BRUSH cutter that pushes its way through a tangled undergrowth like a juggernaut, cutting down everything in its path, is shown in the photo at the right. The device, which is being used in British Columbia to convert the bush into fertile farm lands, has a v-shaped prow built of heavy boiler plate steel, with a projecting saw toothed cutting edge which, when forced forward, throws windrows of brush and small trees to either side. The operator is protected by the timbers and heavy rails that support the plow.



This brush cutting tractor being used to clear farm lands breaks a path through undergrowth with its steel cutting edge.

Streamlines for Old Chassis

A STREAMLINE body built on regular Studebaker light six chassis is shown in the photo below. The only mechanical changes made are the addition of a home-made supercharger and a water tank to provide for sufficient cooling. The lines are graceful and offer a minimum of wind resistance.



Streamline body built on regular auto chassis.

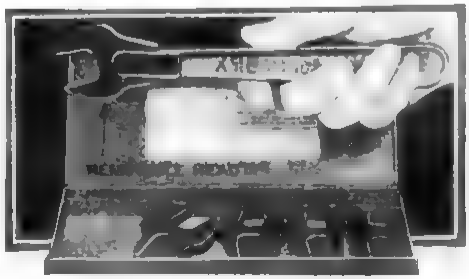
Sea Elephants Melt Houses in Ice

WHEN a baby sea elephant gets stranded in a frigid, blizzard-swept place it makes itself a shelter against the storm by the simple device of lying still and allowing the heat of its body to melt a cavity in the ice in which to take refuge.

In ordinary antarctic weather the thick seal-skin coats of these creatures keep them reasonably warm, aided by the layer of fat or blubber just beneath the skin. But the severe blizzards for which the antarctic is famous sometimes prove too much for them and they have to dig in, or rather, "melt in."

Removable Wrench Heads Ease Machinists' Work in Close Quarters

WORKING in close quarters has always been the bane of machinists, wrecking the nerves and taking an undue amount of time to do a small and unimportant job. However their work can now be made much easier by the use of the set of detachable wrench heads and handle shown in the photo at the right. With these an inconvenient nut can be taken off without the usual adjusting of the jaw of the wrench to fit. The wrench heads are detachable and fit snugly and firmly on the slotted handle. The five different sized heads permit use with nuts of varied sizes. For repairing lawn mowers, vacuum cleaners, washing machines and light weight autos the set is ideal.



A Complete BACK YARD

This back yard playground, occupying very little space, includes a swing, a stunt bar, a merry-go-round, an airplane swing, and a small sandpile with a sun shade.

THE average back yard lot isn't usually spacious enough to permit children much freedom in the playing of their games. Cities and towns grow more and more crowded every year, but healthy, growing children require as much space now-a-days in which to work off excess vitality as they did in the days when they had the whole countryside at their disposal.

The best solution to the problem can be found in utilizing all available space to the best advantage, and the way to achieve this is to build a back yard playground. An exceedingly small area, equipped with a number of sturdy devices will provide merriment and thrills galore, and furnish the kids with opportunities for giving vent to energy that would otherwise be wasted in mischief.

Your children's playground should be as comprehensive as space permits. The accom-

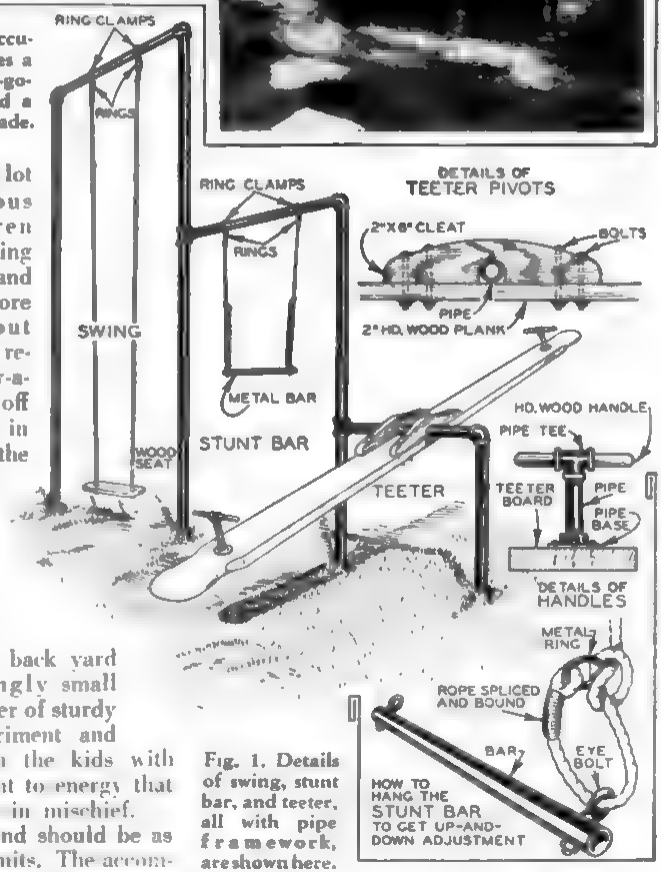
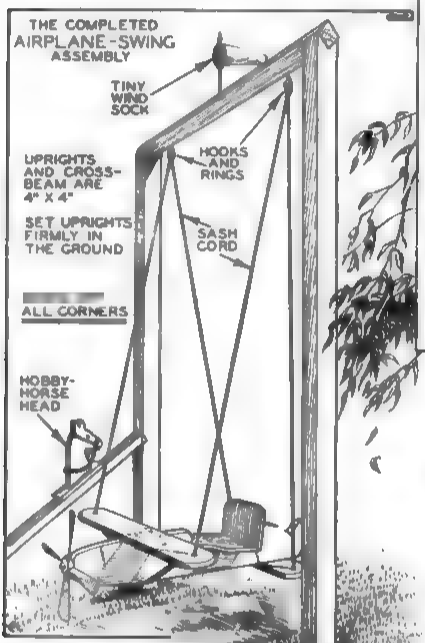


Fig. 1. Details of swing, stunt bar, and teeter, all with pipe framework, are shown here.

Playground for the Children

by DALE R. VAN HORN

Healthy, growing children require some outlet for their excessive vitality. In modern crowded cities and towns, the most satisfactory solution to the problem lies in building them this complete playground.



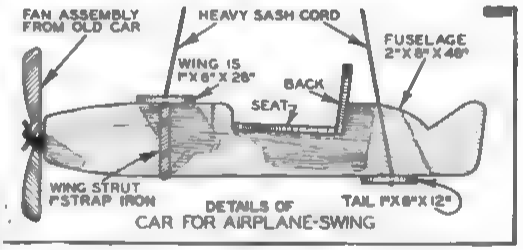
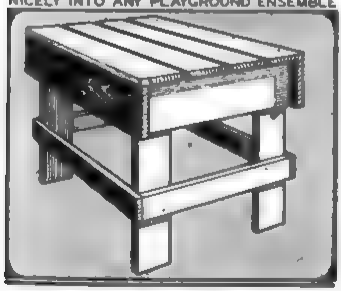


Fig. 2. The airplane swing is constructed as shown here. The parts are assembled with glue and nails.

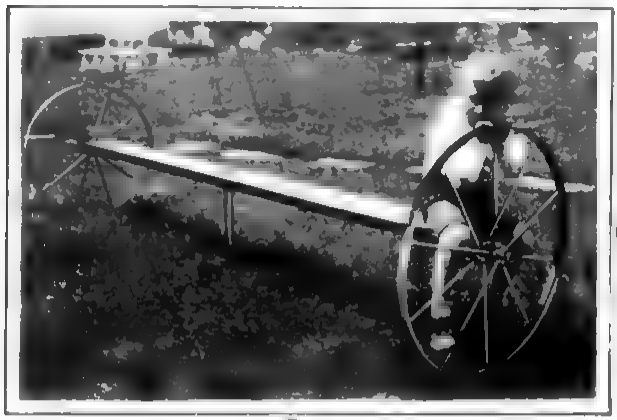
A FEW TINY TABLES LIKE THE ONE PICTURED BELOW MAY BE BUILT FROM SCRAPS OF LUMBER AND WILL FIT QUITE NICELY INTO ANY PLAYGROUND ENSEMBLE



A small workbench such as this makes a handy item for the playground.

panying drawings show plans for the most common devices. Tentatively, we should list the most beneficial pieces of equipment, considering them in order of their cost, ease of construction, as well as their worth from a child's standpoint, as follows: first, swing; second, teeter-totter; third, merry-go-round; fourth, stunt bar; fifth, flying swing; sixth, wading pool. In most cases two or more of these items can be incorporated in one structure.

The playground begins, of course, with the swing. Properly built, a good swing will not require braces or guy wires of any sort. Pipe makes an excellent frame for a swing. It is sturdy, easy to erect, and not in the



Two youngsters can ride this merry-go-round by sitting at the ends of the plank as shown and turning the wheels.

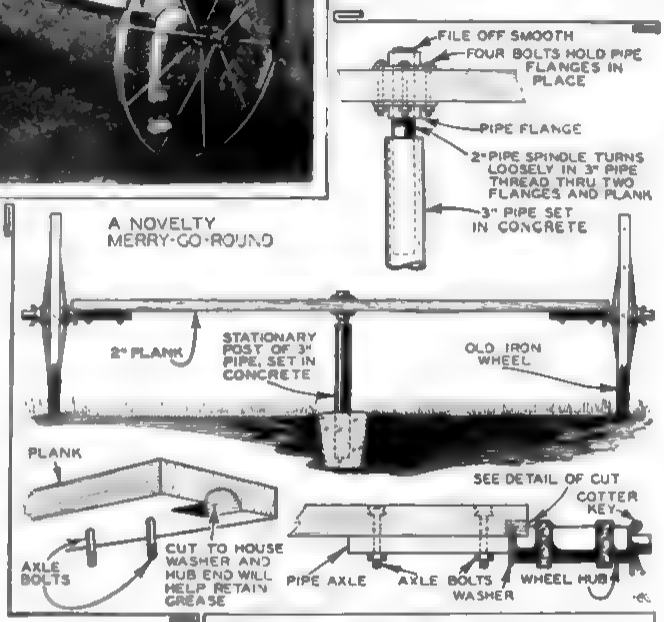


Fig. 3. The above drawing shows details of merry-go-round. The plank is supported by wheels at ends and by pivot pipe in center. Right—photo shows swing and teeter with a wooden frame.

This simple installation can be amplified to include also a teeter-totter, as shown. The teeter plank is supported by a piece of 2x4 nailed to a short post set in line with the swing post, and extending 36 inches above ground. A guard strip is least unsightly. Fig. 1 gives plans for the construction of a durable swing made of 2½-inch pipe set in concrete. With the stunt bar and teeter-totter built onto the sides, as shown, the structure almost makes a small playground in itself. You can raise the swing to any height you wish, but 12 or 14 feet is suggested as adequate. In adding the stunt bar, do not cut the pipe to insert the "T", as this will weaken the swing. Use a "T" large enough to fit over the pipe, and secure it with a metal pin through both the pipe and the "T".

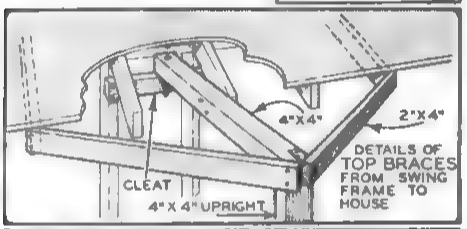
Construction for the teeter-totter, plans for which are given in Fig. 1 also, is extremely simple. The utmost in safety and riding ease is provided by the teeter pivot and handles.

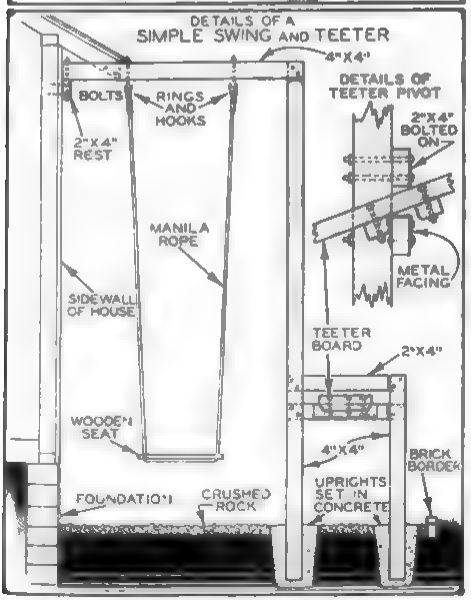
Another excellent method for installing a swing is to set a 4 by 4 post firmly in the ground, four feet from the side of the house, and run a top member across to the roof or wall, as shown in Fig. 5. Braces set from the post top to points a few feet each side of the point where the top member is fastened to the house will prevent swaying.

also nailed just above for greater strength. The plank is provided with cleats underneath set three inches apart to hold it in place. The supporting cleat is covered with sheet iron to prevent excessive wearing of the wood and also to prevent squeaking.

A swing with a seat resembling an airplane makes a novel innovation for a playground and will prove fascinating for children. The frame consists of a pair of sturdy posts, set four feet in the ground, and rising some nine feet in the air, with a cross piece connecting them at the top, as shown in Fig. 2. The fuselage is made from a 2x8 plank four feet long, and the wings from a single 1x6 inch board 23 inches long, with rounded corners. The seat and elevator pieces can be made from scrap pieces of lumber, cut to dimensions shown. An old cooling fan from an automobile makes a realistic propeller. The entire swing is supported by four sash cords attached to the wings and elevators, and run up and over two rings hung from iron hooks, as shown.

Above—Fig. 4. The wading pool should have a concrete basin and an adequate drainage system. Left—Fig. 5. Drawing shows construction of wooden frame of swing and teeter. The 2x4 braces prevent possible swaying.





No playground would be complete without a merry-go-round. Fig. 3 shows a device that will prove extremely durable when compared with most merry-go-rounds, which go out of order after a few days. Two old iron wheels are attached to the ends of a 2x10-inch plank fourteen feet long, which is supported in the center by a pipe pivot. This supporting pivot pipe should be set firmly in a concrete base to provide solidity. Two youngsters can ride on this merry-go-round by sitting astride the plank and turning the wheels.

Details for the pivot are shown in the drawing. Thread the smaller pivot pipe for a distance of about six inches to take the two pipe flanges which are placed on both sides of the board as shown. These two flanges are

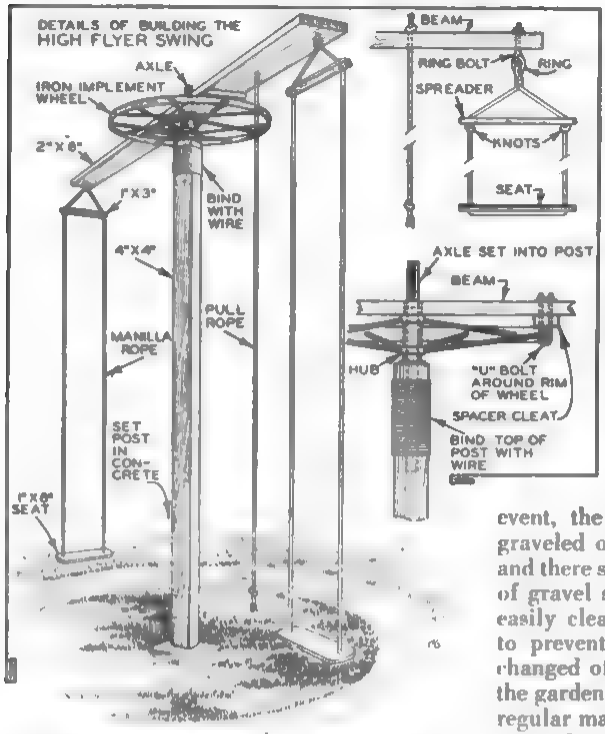


Fig. 6—The revolving arms of the high-flyer swing consist of a plank bolted, as shown above, to an old wheel set atop a center post. As the arms turn the swings fly up and out, furnishing thrills galore.

then bolted to the board, and the smaller pipe inserted in the larger to form the pivot.

You can build, in addition, all sorts of innovations and novelties for your playground. One good thrill-producing device consists of two flying swings suspended from a revolving arm, as shown in Fig. 6, above. The center post is a 4x4 set four feet in concrete and rising ten or twelve feet in the air. On top of this is mounted an old wagon wheel which revolves around a hub made from an iron rod driven into the top of the post, as shown in the detailed drawing. A plank is laid across the top of this pole, centered of course, and fastened in place with U-bolts passing around the spokes and through the plank. Wire will serve the purpose here also.

From the two plank ends, which form the flying arms, depend rope swings. A single rope is also attached to the plank midway between the wheel and the swing, and is used by some one on the ground to propel the device. With a hefty youngster pulling at the end of the rope, the swings will fly about at a good rate and rise up and out in proportion to the speed.

Authorities differ as to the importance of a playground swimming pool. It is generally conceded that other things should come first. A suitable pool is rather costly and it brings up the problem of wet and muddy clothes at any time. Children can have a good time any time with most playground devices, but they should be dressed for wading. And with the pool there, temptation stands hard by, too. In any event, the wading pool should be heavily graveled or walled and lined with concrete, and there should be a two or three-foot border of gravel surrounding it. It should have an easily cleaned drain with screen at the top to prevent clogging, as the water must be changed often. Water can be added through the garden hose, or a pipe line, laid from the regular main, will supply the pool by a mere turn of a valve. Of course, it's out of the question to think of having one pool for lilies and wading, too. The plants and fish would finish a mighty poor second!

Any one of the devices described above will gladden the heart of the child for which it is built. There is no need to build the whole playground at once. You can build a part of it and add other pieces of equipment later. As sod wouldn't last very long, it is suggested that the ground be covered with crushed rock in places where the trampling is heavy. Remember that there's no end of improvements you can make. The big point is, you should have something, even if it's only a swing and teeter-totter.

A playground can be made neater and more attractive by sodding it carefully all around, excepting, of course, the spots where there will be considerable trampling, such as under the teeter and swing, and around the merry-go-round circle. These places can be filled in with gravel, or even better, crushed oyster shells. This will prevent the collection of dust in dry weather and muddiness in wet weather.

New Door Knob Lights Keyhole When Twisted

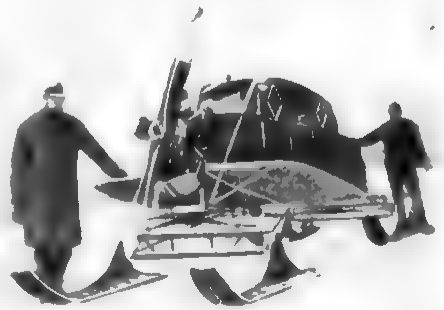
MEN about town will welcome a new invention that has recently been placed on the market—a door knob which contains an electric light that illuminates the keyhole when twisted, thus eliminating the exasperating task of fumbling around for the invisible keyhole in the early hours of the morning. The knob resembles in every way an ordinary knob, but on the inside there is concealed an automatic snap switch and a small electric light bulb. One counter-clockwise twist of the knob and presto! the key hole stands out beneath a glare of bright light.

The light operates from the same current source that rings the doorbell. Either transformer or dry cells will suffice. Turning the knob in the usual clockwise manner will not light up the bulb, but a simple twist to the right snaps on the switch instantly. The knob can be installed in any door in a short time.

A counter-clockwise twist of this new knob throws a ray of light over the keyhole as shown. The cover conceals a small snap switch and flash-light bulb, which gets its current from doorbell transformer or battery. The knob can be installed in any door.

Snow Sled Makes 100 M.P.H.

WHAT amounts to a snow sled driven by an airplane motor and propeller, and capable of a speed of 70 to 100 miles per hour over snow covered country, has been invented by an Idaho man. This novel vehicle, shown in the photo below, consists of a narrow body shaped almost like an airplane fuselage, and mounted on four heavy ski runners. A short wing is attached to the underpart of the fuselage to give the machine buoyancy at high speeds and lessen the shock of bumps. The enclosed cabin has a capacity of three people and is provided with an electric heating system.



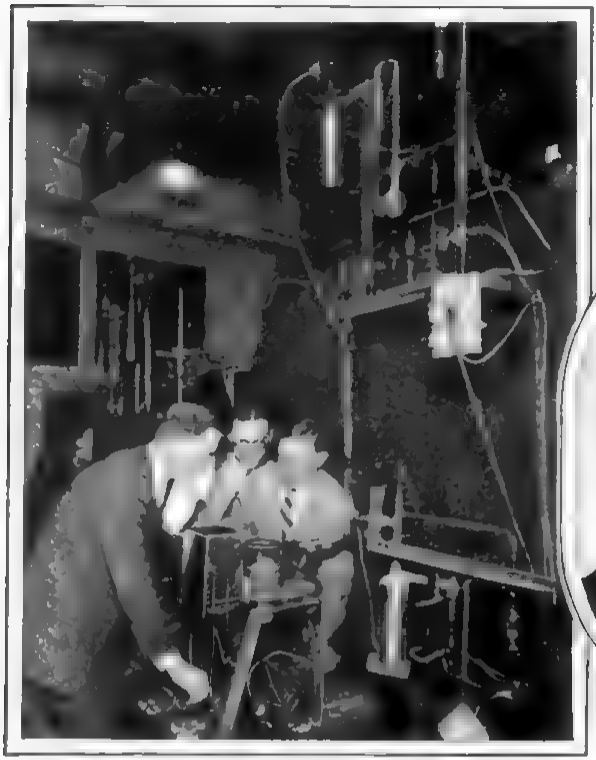
Driven by prop, this snow sled makes 100 m.p.h.

Dry Cleaner Works Like Churn

The clothes, placed in the bag, are cleaned with a few minutes of churning.

USING a new dry cleaning device recently placed on the market, it is possible for housewives to do their own cleaning safely and without odors. The clothes are simply placed in a bag attached to a plunger and then lowered into the jar, as shown in the accompanying photo. After several minutes of churning, the clothes come out clean.

Radium—Science's Most



Gamma rays similar to those given off by radium are now being duplicated by this 2,000,000 volt super-X-ray tube, invented by scientists of Carnegie Institute, Washington, D. C.

Radium, the most mysterious element of science, is now accomplishing amazing feats in medicine and engineering. New uses for this marvelous substance are described here.

Mme. Curie, who with her husband discovered radium at her Paris laboratory in 1898, winning the 1903 and 1911 Nobel prize for work in the field of scientific research.

by **ALFRED ALBELLI**

FAR off in the isolated hamlet of Cabri, situated in a remote part of the province of Saskatchewan, Canada, a woman suffering from cancer listened to her physician solemnly pronounce her death-knell.

"Madame," he said, in the somber note of a doctor who must admit that he cannot cope with the unfathomable ravages of Nature, "I am helpless. Our battle is done. There's only one possible means of saving your life. It is radium."

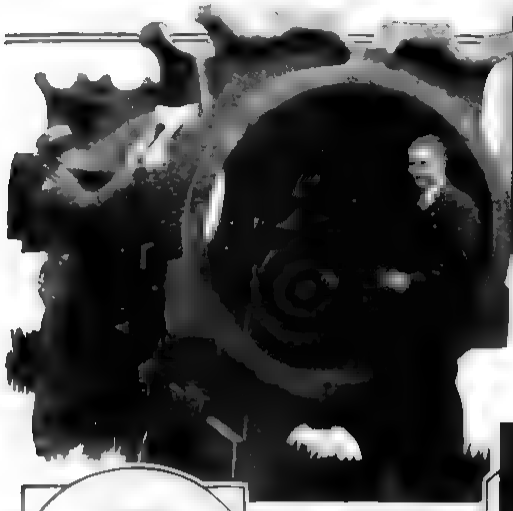
Dr. A. L. H. MacNeill, who ministers to the bodily ailments of the sparse population of Cabri, went on to say, "Madame, I have heard of the wonders of radium. If we could only get some of that precious substance, I am sure you could be cured."

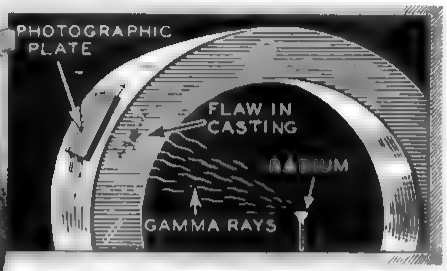
The patient's eyes brightened with hope. It was decided that every possible risk would be made to bring the radium cure to this distant outpost. Thereupon began one of the multitude of radium's glorious adventures.

Dr. MacNeill immediately got in touch with Radium Emanation Corporation in New York City, explaining the situation and telling them that it would be impossible for his patient to travel to New York, so acute was her illness.

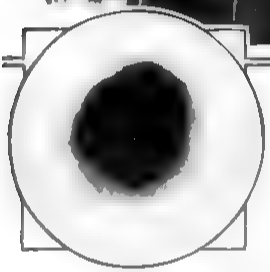
The medic furnished the complete diagnosis and details of his patient's condition and in turn he received, post haste, via airmail, train and dog-sled, several tubes of radium emanations—a radium gas called radon—

Mysterious Servant





In making gamma ray photos to detect possible flaws in metal, a photographic plate is attached to the casting and a tube of radium placed as shown above. Defects stand out clearly as dark spots on the film.



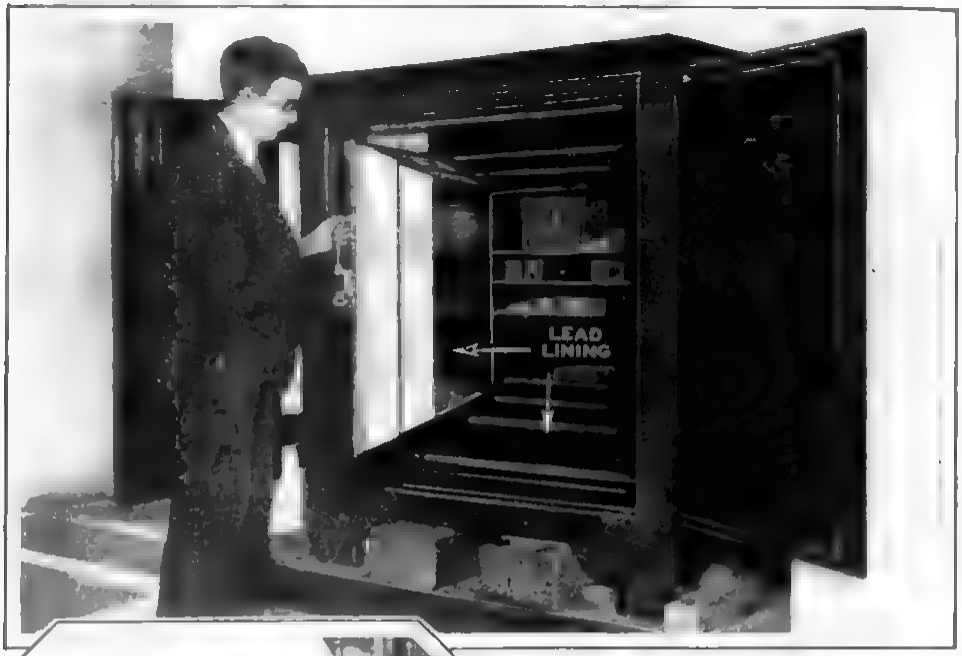
Photographs to detect dangerous flaws in huge metal castings are taken as shown above. Left —A remarkable gamma ray photo, made with radium, through 10 in. steel.

and full directions. The heroic adventure resulted in a cure.

The radon is usually contained in tiny platinum tubes, one-eighth of an inch in diameter. They are encased in rubber tubes and do not come into contact with any other metal, in order to prevent secondary radiation. When radon tubes are then inserted into the malignant tissues, the healing process commences straightway. Occasionally radium itself is used in healing, but the universal use today is the application of the gas, which in the final analysis is the substance which contains the curative properties.

That is radium as it is utilized today. But to get behind this latest development, which scientists readily admit is far from the goal which radium still holds out to them, one must plunge into its inner secrets. Heretofore, so little has been available to the layman on this subject. The truth about radium has remained complicated and concealed in a maze of intricate equations, chemical sym-

Above photos show how gamma rays reveal structures of metal castings and tools. Top picture is of bronze casting; bottom, a monkey wrench.



Installed at Bureau of Standards for holding radium to be tested, the safe shown here is insulated with six-inch lead lining to protect laboratory workers from effects of radium rays.

The tiny amount of radium contained in the four small crucibles in the photo above is what is left after many months of refining of carnotite.

bols and formulas, understood only by scientists.

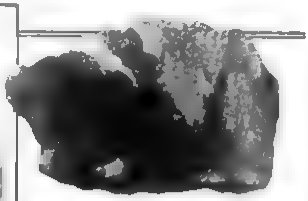
The evolution of radium may be traced back to 1896, to the experimental work of the French scientist, Henri Becquerel, who discovered the action of radium rays. Becquerel found that a uranium salt sent forth rays which made an impression on a photographic plate enveloped in black paper. He also found that these rays could pass through thin plates of metal and other objects opaque to light.

However, it was Madame Marie Curie who made one of the most momentous discoveries in medical history, as well as in the world of science in general. Born in Warsaw, Poland, on November 7, 1867, where her father was a professor of physics, Mme. Curie migrated to Paris to continue her studies and experiments. In the French capital she met Pierre Curie, a young French scientist, and two years later, in 1896, they were married. Both had chosen the field of scientific research for their life work. They used a rickety woodshed on the outskirts of Paris for their laboratory. They were poor, but in their hearts throbbed golden dreams.

Both of them followed the experiments of Henri Becquerel with uranium salts. Quite accidentally, Madame Curie stumbled upon a curious fact. She observed that some of

Radium Extracted From Carnotite in the U. S. by Crystallization Process

Mining carnotite ore for radium. Deposits are found in Colorado, Utah, and Belgian Congo.



A lump of carnotite, a lemon yellow mineral usually found in pockets of sandstone deposits. 600 tons of carnotite yield one gram of radium.

Acid vats shown above are used in the refining of radium, which is extracted from carnotite by a process of crystallization to drive off impurities.

the rays emanated from uranium exerted an activity three or four times greater than that of pure uranium itself.

This the Curies had established, to themselves, as a scientific fact, though their skeptical friends frowned on their pretentions. Madame Curie then began her experiments with pitchblende—a hard, blue-black ore that looks something like magnetite, but is much heavier. She suspected that this compound of uranium contained some hitherto undetected substance with far greater radioactive qualities than the metal uranium itself. It was this product which Madame Curie determined to isolate and experiment with.

After scores of tedious chemical operations, she succeeded in separating two sub-

Great care and skill are required of these chemists, who are shown putting $500,000 worth of radium through the final steps of refinement. The refining plant is a great distance from mines.

Radon Destroys Cancerous Growth, Leaves Healthy Tissue Unharmed

This new extremely sensitive electroscope, invented by J. H. Hanson, of Los Angeles, was used recently to locate a $4000 lost tube of radium.

The single gram of radium contained in this tiny tube is valued at $70,000.

Gamma rays given off by radium have highest known frequency, attaining a range of 300,000,000,000,000 kilocycles, as shown in drawing.

Gamma ray photos are made by grouping castings with attached photographic plates around a tube containing minute quantity of radium, as shown.

stances from pitchblende. One she called polonium, after her native land, Poland, and the other, radium. These discoveries were made in the wood-shed laboratory, where an old gas furnace and some melting-pots had been installed. It was there that she often spent entire days stirring large pots of chemicals with a long iron rod. It was from these crude tools and "never-say-die" heart that radium was given to mankind for practical uses in 1898.

Four years later the Curies announced that they had succeeded in making their radium a pure chemical body. In 1903 and again in 1911 Madame Curie was awarded the Nobel Prize. In 1907 the late Andrew Carnegie, the steel magnate, presented her with a laboratory which was the first real workshop she ever enjoyed.

Scientists gradually discovered that radium or its gas, called emanations, could be used in treating cancer, tumors, ulcers and allied conditions. The "Becquerel burn" perhaps led to the first discovery of the effect of radium on the skin. Henri Becquerel happened to place a tube of very active radium in his vest pocket, just to keep it handy. He kept it there for several hours, never suspecting anything, then put it back in his laboratory. Two weeks later he discovered a burned area on his body. Recalling that the seared skin was exactly where the radium tube had been, he communicated his discovery to Pierre Curie.

So fascinated was Pierre Curie that he decided to experiment with his own skin, applying the radium to his hand in weak degrees. He became amazed at the possibilities presented. In turn he loaned a tube of radium to the Saint-Louis Hospital of Paris for further medical experimentation.

It was first applied to a case of tuberculosis of the skin. The results were excellent. The patient was thoroughly healed. Soon the demand for radium for therapeutic uses spread like wild-fire. The name of Curie was clothed in glory, but the modest couple preferred the quiet and peace and industry of their little

(Continued on page 204)

Cabin Flung From Speedboat in 40 m.p.h. Race Smash-up

A TERRIFIC crash resulting in the sinking of one speedboat and the running wild and grounding of another occurred recently in the harbor of Sydney, Australia, when the *Century Tire*, piloted by R. Walder, struck squarely the *Merilie*, driven by Dr. R. W. Storer, at the finish of a race in which both boats had been hitting up a 40 mile an hour clip. The impact of the crash sent the cabin of the *Merilie* hurtling through the air, after she had been declared the winner, while the *Century Tire*, her steering wrecked, got out of control and ran upon the beach near by. A photographer was on hand to get a remarkable photo of the crash, shown at the right. Neither of the drivers was hurt.

Photo shows crash of "Century Tire" and "Merilie" in Sydney.

Movie Star Builds Invalid Desk

Jimmy Gleason, popular film comedian, with the desk arrangement which he built for Anna Q. Nilsson, well-known movie star, for boat travel.

THE inventive ability of Jimmy Gleason, popular film comedian, was demonstrated recently when he built a special chair desk to be used by Anna Q. Nilsson, well known screen star, who is suffering from a broken hip that will not allow her to use a reclining deck chair on her boat trip to her homeland, Sweden.

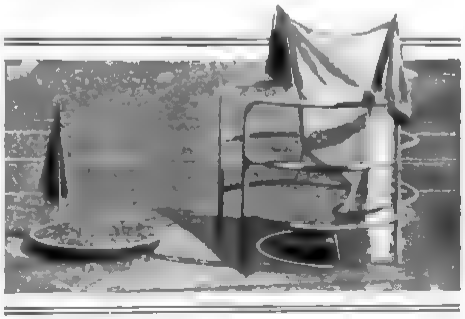
In rigging up the chair Gleason first obtained a canvas chair and a dressmaker's lap board to serve as a desk. On the lap board he painted Miss Nilsson's name, with a greeting.

Dishes Save Lives of Millions

STRANGE as it may seem, china dishes are chiefly responsible for the enormous increase in population in Europe. In earlier days people ate meals out of a common pot or off a flat piece of board. These primitive methods caused the spread of millions of disease germs, as the boards often went unwashed. The invention of dishes deprived the germs of their hiding places in the pores of the wood, and thus brought about a decrease of infectious diseases.

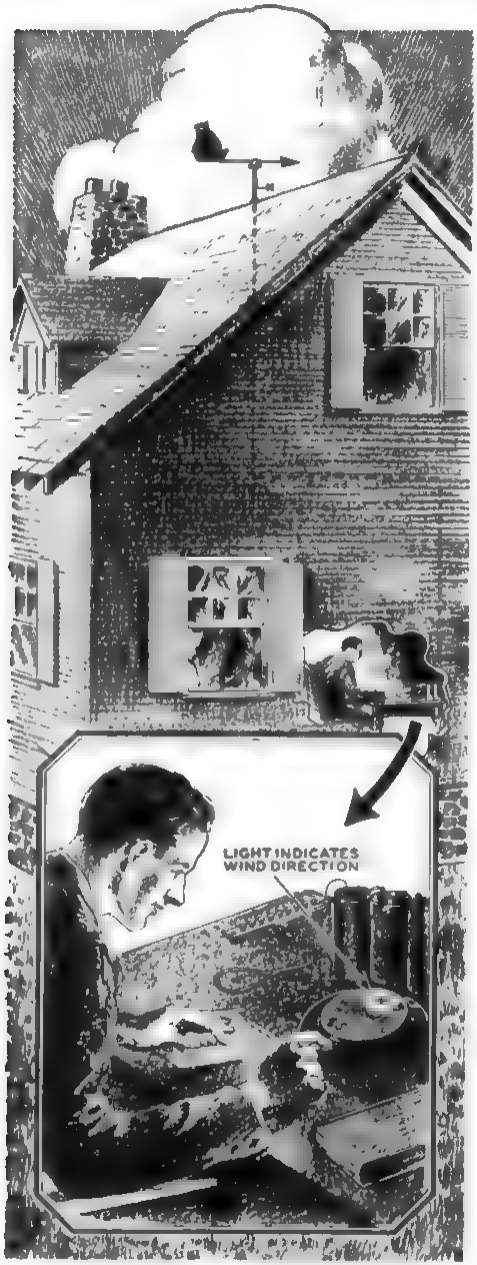
Canvas Deflector Airs Manholes

TO PROVIDE workmen with sufficient ventilation when laboring underground on cables, engineers of the Pacific Telephone and Telegraph Company have devised a canvas wind deflector which diverts all passing breezes down into the manhole. This deflector, built on the principle of a ship's windsail, consists of an outspread sheet of canvas supported by a pipe framework, as shown below. The wind, striking this deflector, passes down an attached five-foot canvas tube having a diameter of nine inches at the bottom and twelve inches at the top.



Wind striking outspread sheet of canvas of this deflector is diverted down chute into manhole.

Electric Weather Vane has



The weather vane should be mounted in a clear space and leads run down through roof to terminal strip as shown here. Pressing push button lights bulb indicating direction of the wind.

by

R. A. FLETCHER

Amateur weather forecasters and aviation fans will find this electric weather vane just the thing for their home meteorological stations. All you have to do to find out accurately which way the wind is blowing is to press the button, and the light on the dial shows direction.

IF YOU are a meteorology student and like to do a little weather forecasting on your own hook—well, here's a fascinating little instrument—an electric weather vane, that will prove an indispensable piece of equipment for your home weather station. Similar to the vanes used in the large meteorological stations, it will tell you the way the wind is blowing while you sit comfortably in your room. All you have to do is press the button, and a light flashing on the indicator dial shows you wind's direction.

To make the standard, secure first a small piece of fibre about one-eighth of an inch thick, cut to the shape of a disc 1½ inches in diameter. Next, cut another disc from some sheet brass about one sixteenth of an inch thick and of the same diameter as the one of fibre. Mark off on the brass disc eight equal divisions as shown in the drawings on page 158. Drill a three-eighths inch hole through the center of the brass disc, then drill a one-eighth inch hole through the fibre one and tap. Rivet on the brass disc as shown, then cut on the lines with a hack saw, just through the brass.

Next, obtain a piece of one-half inch cast iron pipe about ten or twelve inches long. Thread both ends, then cap one end with a regular pipe cap. Then dress down the end of the cap to be absolutely square and flat. Find the center, then drill an eighth inch hole and tap.

Now, take a piece of 5/32" brass rod, 1½" long, and thread one end for about one half of an inch. Screw this threaded end through the fibre as far as it will go, then into the pipe cap, as shown on page 158.

Solder a small, well insulated bell wire to

Remote Control Indicator

a rivet of each one of the segments. Pass these eight wires through holes drilled in the side of the pipe near the top, and bring them out at the lower end, through a slit as shown on the opposite page.

To make the selector, obtain a piece of brass ½" square and 1¾" long. Square this up on the ends and sides. Find the center and drill a ⅛" hole. Ream to fit the upright or vertical bearing already in place on the standard. Measure over from this hole three-eighths of an inch and at this point drill a ¼" hole, ⅜" deep.

Next, drill and tap an ⅛" hole in the center of either end about ½" deep. Into these holes screw the brass rods to which have been soldered the arrow head and the brass figure, as shown.

Now, into the ¼" hole, fit a very light coil spring and over it a carbon brush. This brush can be simply the carbon positive pole from an old radio "B" battery.

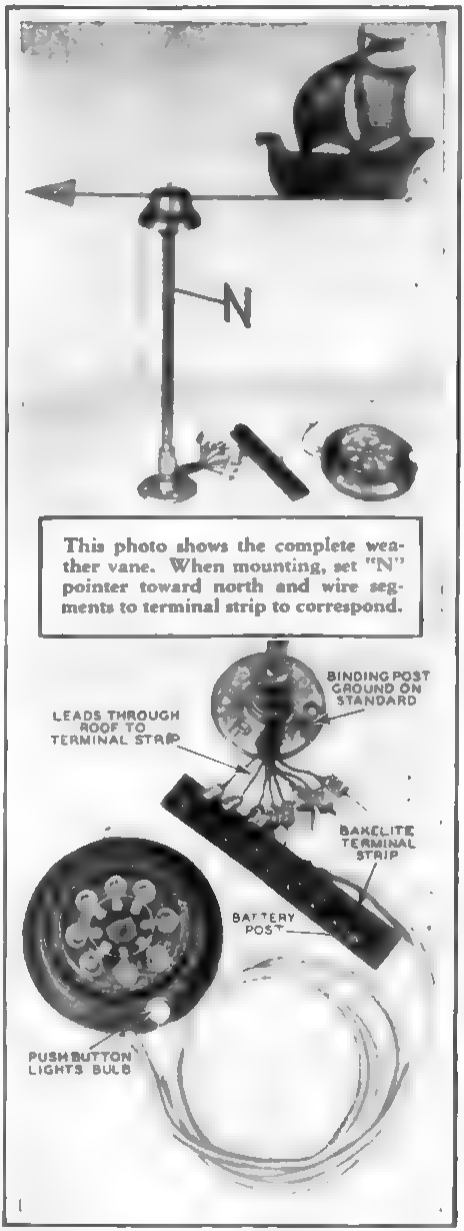
Slip a very small and thin fibre or hard rubber washer on the vertical bearing, then put your selector unit in place. Hold the carbon brush and spring in position by using a thin piece of tin which can be readily pulled out once the selector is in position.

It is a good idea to have a cover for your selector unit to keep the rain and snow off the commutator. Some aluminum utensil can be used here by slitting the sides to fit down over the two rods as shown in the photos and drawing.

Now, you must make the dial, or the instrument that registers in your house the direction of the wind. Turn from a piece of black walnut, oak or gum, 2" thick, a case as shown on page 158. Space evenly around the hole in the center eight small sockets with bulbs, in positions to correspond to eight points of the compass.

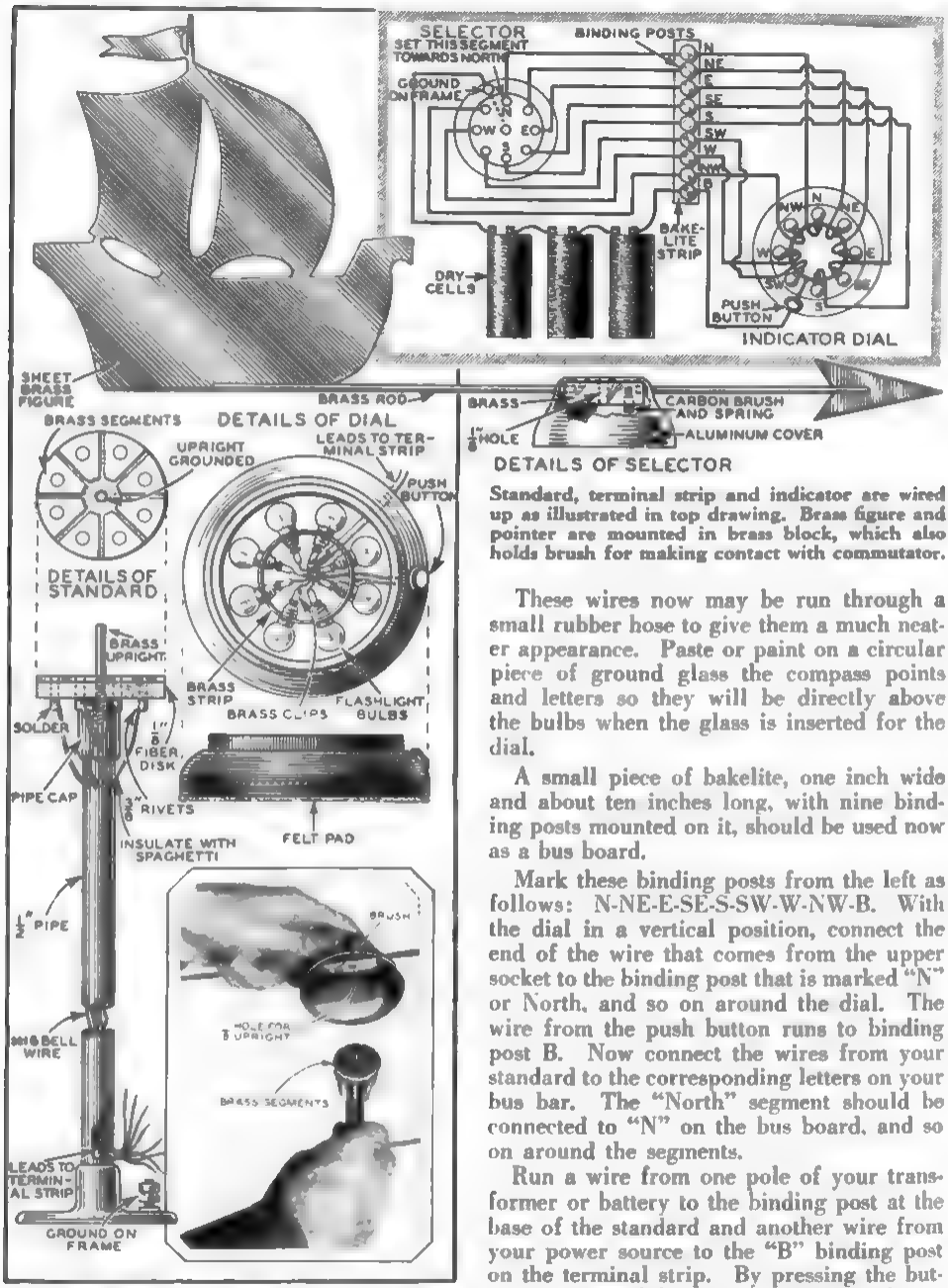
Next, drill in from an angle a hole large enough to take a pearl door bell button. From one side of this button run a small No. 16 wire to the common connection of all the sockets. Take another piece of the same wire, run it to the center, then out of the instrument through a small awl hole.

Now, cut eight lengths of No. 16 cotton covered bell wire and connect one end of each to each of the sockets, pulling the opposite ends through the hole as shown.



This photo shows the complete weather vane. When mounting, set "N" pointer toward north and wire segments to terminal strip to correspond.

Leads from segments are marked 1-2-3, etc., and wired to N-NE-E, etc., binding posts, as shown above. Battery hooks between ground post on standard and battery post on terminal strip. Leads are encased in rubber tubing for neatness.



Above drawings show construction of standard and indicator dial. The eight brass segments for the eight directions are fastened to the fiber disk with rivets, to which are soldered leads to indicator. The bulbs are mounted in sockets constructed as shown.

Standard, terminal strip and indicator are wired up as illustrated in top drawing. Brass figure and pointer are mounted in brass block, which also holds brush for making contact with commutator.

These wires now may be run through a small rubber hose to give them a much neater appearance. Paste or paint on a circular piece of ground glass the compass points and letters so they will be directly above the bulbs when the glass is inserted for the dial.

A small piece of bakelite, one inch wide and about ten inches long, with nine binding posts mounted on it, should be used now as a bus board.

Mark these binding posts from the left as follows: N-NE-E-SE-S-SW-W-NW-B. With the dial in a vertical position, connect the end of the wire that comes from the upper socket to the binding post that is marked "N" or North, and so on around the dial. The wire from the push button runs to binding post B. Now connect the wires from your standard to the corresponding letters on your bus bar. The "North" segment should be connected to "N" on the bus board, and so on around the segments.

Run a wire from one pole of your transformer or battery to the binding post at the base of the standard and another wire from your power source to the "B" binding post on the terminal strip. By pressing the button now, one of the small bulbs will light.

Be sure to check carefully to see that the top light of the dial corresponds to the segment on the selector, designated as "North," towards which it should point.

Flexible Head Rest for Auto Mechanics

by **RAY F. KUNS**

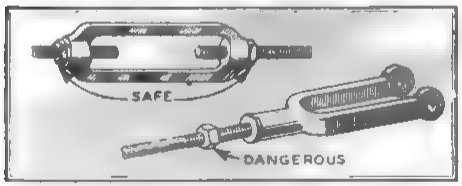
This Motor Mechanics Department, conducted monthly by one of the country's leading automotive authorities, brings to the car owner many helpful hints in the care and maintenance of what is probably his most expensive item of mechanical property.

The handy head rest is shown in use. The device is so light that it may conveniently be worn in position though not in use.

SUITABLE for use as a pillow when on a camping trip, or by the motorist or mechanic when at work under a car, is a flexible headrest consisting of a soft pad for the back of the head mounted on a strong wire frame.

Due to the fact that a band fits around the head and holds the device in place, it may be worn by shop men all day long if desired or can be taken off and put on only as needed. The novel headrest is made of flexible material, weighs only a few ounces, and is always ready for immediate use. It does away with the use of bricks, blocks and creepers by the auto mechanic, and in many instances saves the time of jacking or blocking up cars.

Keeping the Lock Nuts Tight



Be sure that all your lock nuts are tight.

WHEN giving the car the periodical check-up and tightening, make certain to catch up on all the lock nuts which are used in the various positions as a means of safetying the various assemblies.

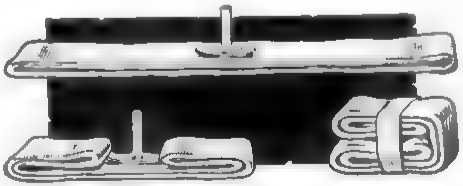
In case a brake clevis or turnbuckle lock nut is allowed to ride loose the threads of the brake rod and clevis yoke will become worn and failure may result in an accident.

How to Roll a Spare Inner Tube

WITH good roads and good tires, inner tubes may be carried for many months before they are used. Then, when occasion arises to use them, we find that they are in bad condition, ofttimes owing to faulty storage.

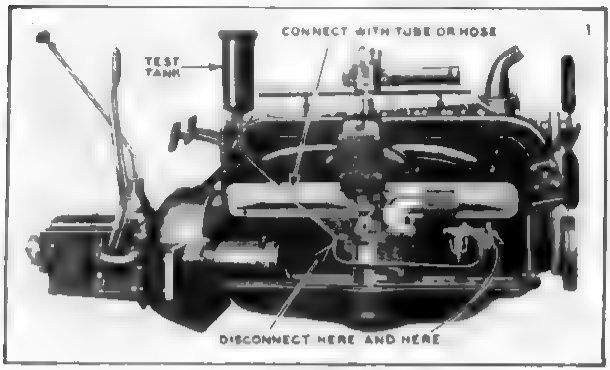
When preparing an inner tube for carrying, first remove the valve inside and completely deflate the tube, as shown in the upper part of the figure. Next slip a piece of cardboard around the tube stem or use a short length of garden hose or similar protective material. Next fold the tube from each end inward, as shown, and finally roll these ends up and over the tube stem until the package appears as shown in the lower right. Use a section of an old inner tube for a rubber band to hold the roll. Wrap in newspaper or store in a cardboard box.

The less chance there is for vibration of the rubber the less likelihood that it will become cracked and scuffed. The paper wrapping keeps out light and prevents deterioration. Try to store in the car where the tube will not be subjected to heat from the exhaust.



Here's the correct way to fold an inner tube. The valve should be removed and the tube completely deflated, as shown in the upper sketch.

Pointers on Making an Exact Fuel Consumption Test



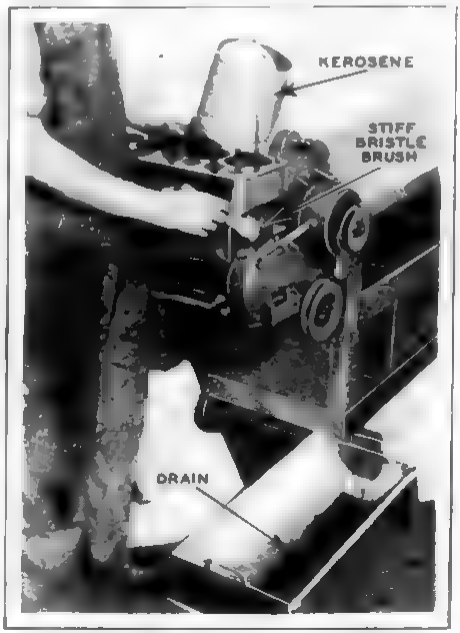
A vacuum gas tank, with the simple rig shown above, will enable you to make an accurate check of fuel consumption.

A METHOD easily used and most accurate in making an exact fuel consumption test is to make use of a device such as shown in the illustration. This is an old vacuum tank shell which is connected up to the carburetor. The carburetor fuel supply line from the original tank is removed. Another fuel supply line is run in from the test tank. The hook-up may be by means of copper tubing or rubber hose.

When making a test, the first thing to do is to put in a small amount of gasoline and drive the automobile until this amount of gasoline has been used and the car has stopped because of lack of fuel. Next pour in an exact quart of gasoline in the test tank. Start the engine after a moment and operate the car in gear until all the fuel has been exhausted. By taking the speedometer reading at the start and finish of the test, a rather exact idea may be secured of the mileage covered by a quart of gasoline and, of course, from this point, it is easy to figure the mileage per gallon. Starting with a dry carburetor and finishing with a dry tank and carburetor is an authentic test, if the fuel is measured exactly and none of it has been spilled.

An Easy Way to Keep Your Engine in Spick and Span Condition

NOTHING occasions the car owner more satisfaction than raising the hood to view a spick and span job, one which is free from grease, oil and dirt. If they would only stay that way, but they won't. The owner who will make use of a stiff bristle brush, as shown in the accompanying illustration, using kerosene or gasoline to flush away the grease and dirt, will find that he is more than repaid in the satisfaction of having a clean power plant. However, if the job is neglected too long, as in this case, then it is quite a chore to clean it. If it is cleaned before the grease or oil really cakes, the job requires but a little while. It is not necessary to remove the engine from its bed to do a thorough, satisfactory job of cleaning.



A stiff bristle brush and a can of kerosene will clean the engine very nicely. Here's the way.

Keeping Check on That Battery

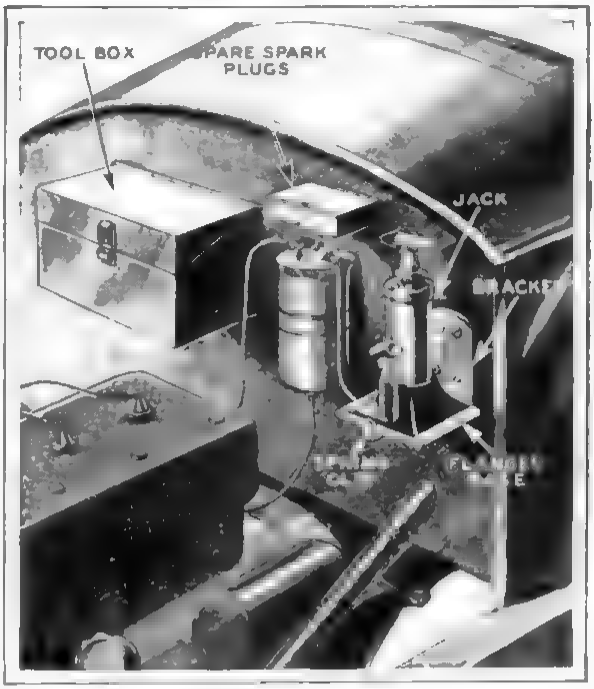
DO NOT forget to check the battery for water and for hydrometer reading. Never attempt to read the gravity of the battery immediately after filling with water. Do this after the car has been driven a while, since the charging action is necessary to mix the water and the electrolyte and give a true reading.

Carrying Your Tools and Spare Parts Under the Hood

THE problem of finding space for the jack, wrenches and spare parts, which may be needed frequently, is one which bothers many tourists. When the car is in ordinary everyday use there are usually compartments available for carrying these but when the car is fully loaded with passengers, baggage or camping equipment it is ofttimes a matter of considerable inconvenience to get at the tools desired.

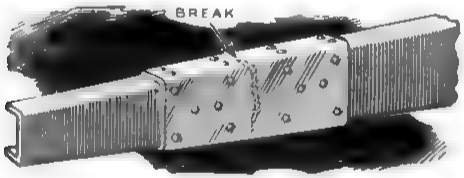
The artist's suggestion shows a tool box mounted on the cowl, also a spare plug and a jack.

Sometimes space will be found alongside of the engine where the spare oil can or a tool box may be placed. Particularly is it true that with the newer cars more space is available under the hood. The only thing which needs to be borne in mind is that nothing must be done which will interfere with the passage of air through the engine compartment as this might result in a case of overheating.



More and more tourists are making use of the space under the hood for carrying much needed tools and spare parts.

Repairing a Cracked Car Frame



This simple splice will repair that cracked frame as shown and will save an expensive garage bill.

THE most usual point at which breaks occur is close to the rear supports or engine arms. This is due to the fact that the weight of the body and engine centers at this point. However, breaks may occur elsewhere.

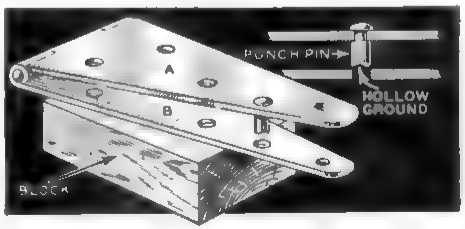
If on a tapered section of the frame, go to the junk yard and secure a section from another frame having the same taper. Slip this over the broken frame and bolt or rivet, as shown.

Where breaks occur in a straight channel section it is ofttimes possible to secure a section from another car frame which will just fit over the one to be repaired.

Making a Simple Gasket Punch

AN ORDINARY steel hinge may be adapted for use in punching gasket material in a clean cut manner.

A 1/4" hole is drilled through both upper and lower leaves. A punch pin is then made up and inserted in the upper leaf. It will be noted this pin has a shoulder on it so that when riveted into the leaf it is rigidly attached. The bottom of this pin is ground or filed hollow so that two points are left to penetrate the gasket material. If desired, a wood handle may be attached.



If the holes in A and B are drilled together you will be certain that they are perfectly aligned.

Why Not Give Your Motorcycle Chain a Longer Life?

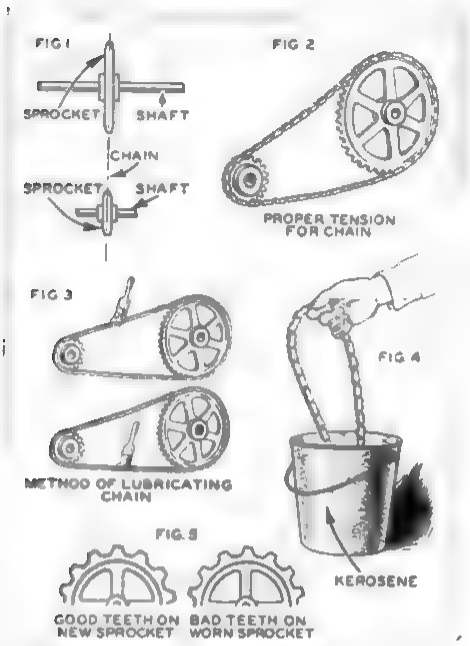


Fig. 1 shows how the sprocket chains should be aligned. Fig. 2 shows the correct tension for the motorcycle chain to insure long life. Fig. 3 illustrates the correct method of lubricating the inner and outer sides of the chain. Fig. 4 shows a simple way of cleaning, and Fig. 5 shows why old sprockets slip.

Spark Control of the Motorcycle

MOST power can be obtained only when the piston is in the correct position to receive the pressure inside of the cylinder. Advancing and retarding the spark are the correct terms for this control. Advancing the spark means to ignite the charge earlier in relation to the piston position. Retarding means to cause the spark to occur later.

It is very incorrect to state "give the engine more spark or less spark." The volume of the spark is not controlled. An efficient driver retards the spark for slow, smooth running and hard pulling and advances it as the speed of the motor increases.

By observing the performance of the engine you can learn to instinctively control the spark. A single or twin cylinder engine is especially sensitive and the spark control must be properly handled to obtain smooth running, good acceleration and slow pulling power on hills.

IF YOU would have long life from the motorcycle chains watch that the chain sprockets are aligned, as indicated in Fig. 1. The shafts must be aligned and the sprockets must be aligned. The proper tension for the chain is indicated in Fig. 2. If a chain is too tight it is likely to wear rapidly or may be broken.

Keep the chain lubricated. This may be done as suggested in Fig. 3, using a one-inch paint brush and some light engine oil. Have the chain turning over slowly and apply the oil to the outside first and then to the inside, as suggested.

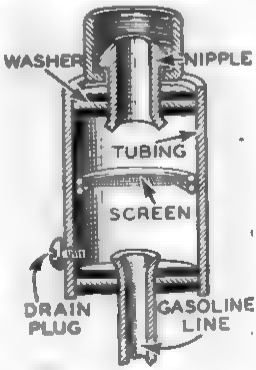
When you have an opportunity, pull the chain from the motorcycle and wash it in a pail of kerosene, as suggested in Fig. 4. When it is removed from the kerosene, dry it thoroughly and paint with oil, as suggested above.

Finally, give the chain sprockets a careful inspection from time to time to see whether they are in good condition or whether they have become worn, with bad teeth, as shown in the bottom view of Fig. 5. If found to be in such condition that the chain tends to "climb," they should be renewed in order to save chain breakage.

Motorcycle Gasoline Strainer

TO MAKE a gas strainer for your motorcycle, first remove the solder from the nipple on the gasoline line. Next procure a piece of brass tubing one inch in diameter and 1½ inches long. Close both ends with ⅛" brass washers soldered in place, and drill holes for the nipple and gas line.

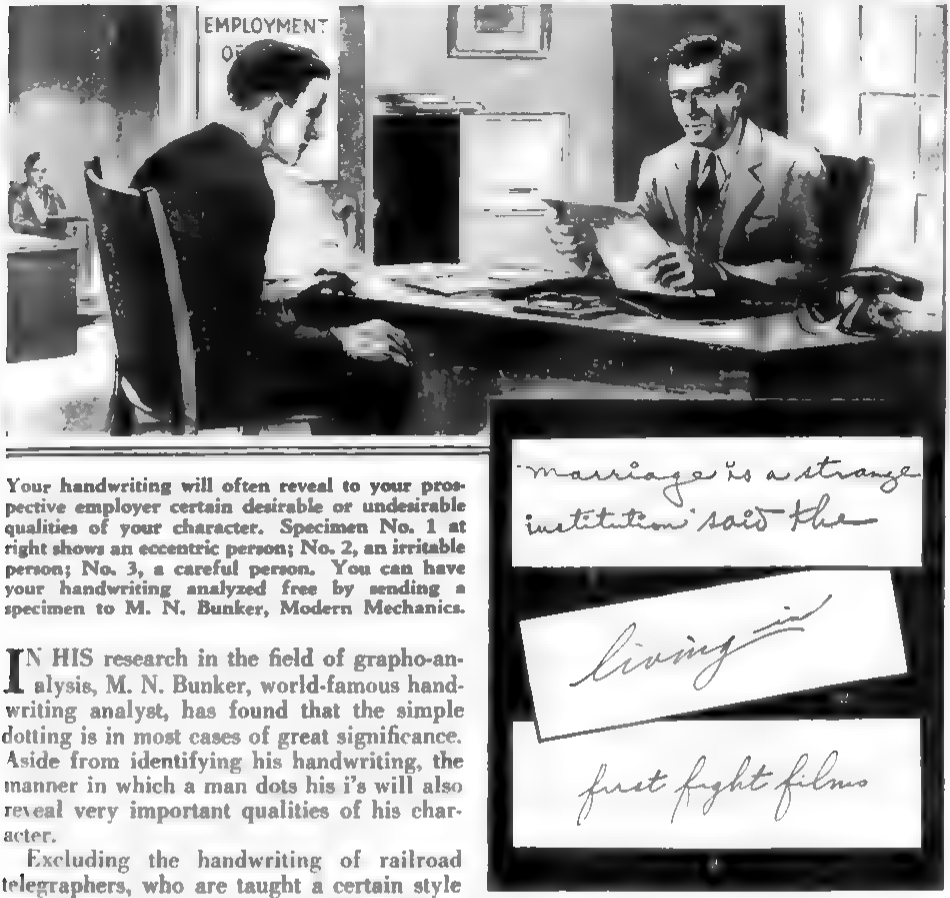
A piece of fine brass screen, with brass rings to hold it in place, is placed in the tube, and a hole tapped near the bottom of the tube for the screw plug.



A good job of soldering will make this a first class gas line strainer for your bike.

Expanding the ends of the nipple and tubing after they are in place and before soldering, strengthens them greatly. Do a good job of soldering.

Free ANALYSIS of Your Handwriting



Your handwriting will often reveal to your prospective employer certain desirable or undesirable qualities of your character. Specimen No. 1 at right shows an eccentric person; No. 2, an irritable person; No. 3, a careful person. You can have your handwriting analyzed free by sending a specimen to M. N. Bunker, Modern Mechanics.

IN HIS research in the field of grapho-analysis, M. N. Bunker, world-famous handwriting analyst, has found that the simple dotting is in most cases of great significance. Aside from identifying his handwriting, the manner in which a man dots his i's will also reveal very important qualities of his character.

Excluding the handwriting of railroad telegraphers, who are taught a certain style of writing, if you find the i's dotted with circles as in specimen No. 1, look for an individual with many little mannerisms that are strictly his own. Such a writer will choose distinctly individual clothing. He may wear a monocle when he is the only one doing such a thing. There is an underlying desire to be different—to have outstanding differences in nature from his associates.

If the writer makes the i-dot far above the top of the letter, and like a tiny arrow, you may know that he is easily annoyed. If the dot is very light, like the first one in specimen No. 2, then this irritation will not be likely to show itself. It will be merely an annoyance which will vex him without showing on the surface.

If the little arrow becomes heavier, as in the second dotting in specimen No. 2, then you have temper—the kind that explodes quickly, and dies down just as quickly. Such a writer wants other people to move when he speaks, and though he may not openly domineer, there is a feeling that other folks should "snap into it" when he wants anything done.

If your writer makes a small dot close to the point of his i, you may be sure that you have a nature that is very careful about small details. A mechanic who does this will have his tools in perfect order. He will always do a job of work thoroughly.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting, to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

Dodging Death with the

Billions of virulent disease germs are locked up in these test tube cultures in government laboratories.

HOW would you like to be regular gardener for the queerest garden in the world, made up entirely of germ cultures of mysterious diseases, some of them so powerful that actual contact with them might snuff out your life in a couple of days? This is one of the daily hazards of government health officials. Naturally the nation's far-flung system of disease prevention and control requires a large personnel, comprising more than 8,000 men and women, working under the guidance of officials at the central laboratories at Washington, with an average annual expenditure to Uncle Sam of almost $11,000,000.

This government hunter has shot a mountain goat which will be examined as a possible host of Rocky Mountain Spotted Fever germs.

Government health officials have to solve all sorts of medical problems. A physician in a southern town wired a health investigator to come at once to advise him in regard to proper treatment of a case of "Lushmaniasis," a mysterious Oriental disease, little known in America. Upon arriving at his destination, weighted down with elaborate laboratory equipment, it took him but a short time to cure the "disease." It seems that the

Public Health Service

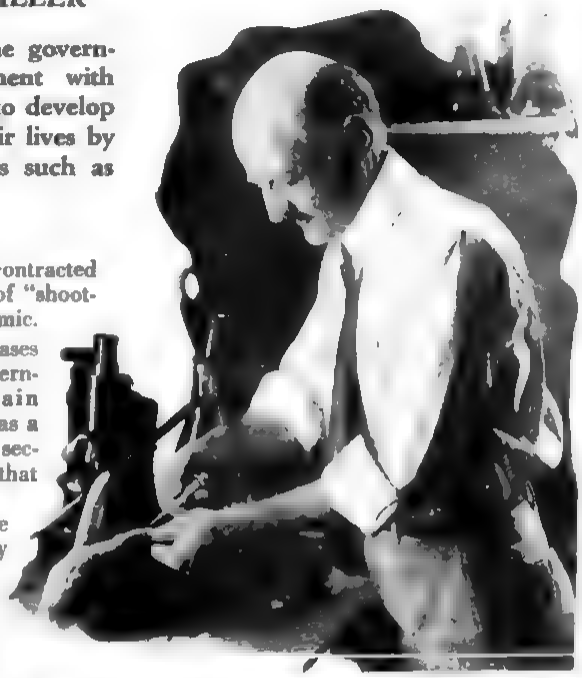
by JAMES NEVIN MILLER

Day after day members of the government health service experiment with deadly germs of rare diseases to develop new medical cures, risking their lives by contracting dangerous illnesses such as tularemia and Dengue fever.

patient was a dope fiend who had contracted a series of boils from the practise of "shooting" himself with a dirty hypodermic.

One of the most dangerous diseases now under investigation by the government scientists is Rocky Mountain Spotted Fever. It has been feared as a fatal malady in the northwestern sections of the United States ever since that region was first settled.

Since one attack of the disease apparently develops an immunity

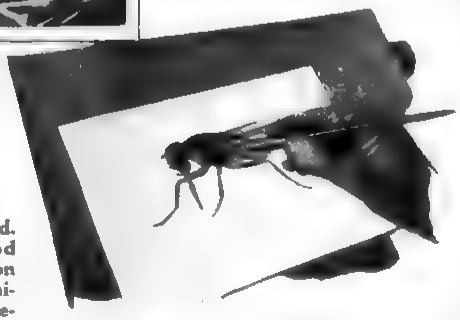


The rabbit is the natural host of tularemia germs. This one is being inoculated in the process of preparing vaccine.

This scientist is preparing a culture of disease germs in a test tube. Reaction of germs to different conditions is studied in this way, and methods of destroying them discovered. The laboratory method involves the reproduction of specific diseases in animals, which are then carefully studied, and cures developed.

to future attacks, the possibility of a vaccine suggested itself at once to the investigators. Here an initial difficulty was encountered: for it was found that the virus could not be cultivated in the usual laboratory way, in a test tube.

However, it also was discovered that the virus is developed and carried in the bodies of the ticks which transmit the disease. Hence it was decided to use the ticks as test tubes and prepare the vaccine from them. The ticks were allowed to feed upon infected guinea pigs until they had become thoroughly infected themselves. Then at the time when experiments showed the virus to be most concentrated, the ticks were ground up, and an emulsion was



Flies and ticks carry many diseases, so experts spend much time in studying them.

prepared with a solution of phenol, the preservative used in making most vaccines.

Even more mysterious, perhaps, than Rocky Mountain Fever, but not so dangerous, is the disease called tularemia. Back in 1910 there came reports from Utah and adjacent states of a peculiar human ailment popularly known as "deer fly fever," accompanied by ulcerous sores and swollen glands, and in other characteristics resembling typhoid, particularly in regard to the fever stage, which lasts from two weeks to a month and sometimes even disables a man for as long as six months.

Every person—six all told—who has worked on the tularemia investigation in the government laboratories in Washington has contracted the disease. All have recovered, however, and fortunately for the research workers, it has been found that ordinarily persons who have once had the malady are thereby immunized. The work is now carried on by an immune crew of workers in a room shut off from the rest of the laboratory workers and avoided as much as possible by those having no official business there.

Slides studied under the microscope often give scientists their most valuable data in combating diseases.

Government scientists discovered for medical science that wild rabbits, ticks and flies are the agents through which man is infected by tularemia. The ticks and flies transmit the disease by biting a man after they have bitten an infected rabbit.

This laboratory worker is siphoning out a tube full of blood taken from infected animals, preparatory to subjecting it to tests which may uncover a curative agent.

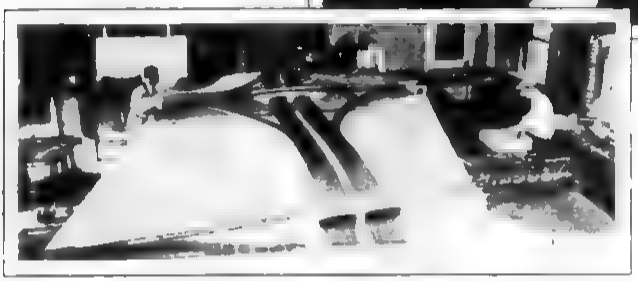
Direct transmission from rabbits to man occurs only when the internal organs of the rabbit are handled, the investigators found. Cuts, scratches and other skin abrasions of the hands afford a portal of entry for the infection when dressing an infected rabbit. In addition, there is good evidence for believing that the bacterium of tularemia is one of those rare organisms which can pass through the unbroken human skin.

Another puzzling malady of nationwide interest is pellagra. In fact, for more than 100 years the medical world sought in vain for its cause and cure. Government investigators were able to prove, not so long ago, that the ailment is due to a faulty diet, the primary fault being a deficiency in a food essential, probably of the nature of a vitamin, which has been provisionally named vitamin P-P-, or pellagra-preventive. This vitamin is believed to be present in most all natural foods except the oils and fats, but in greatly varying amounts. In any case, health experts have cured the disease by dietary measures.

Capitol Displays Perfect Model of Mount Vernon Road

IN THE rotunda of the Capitol, in Washington, D. C., there is on display a remarkably true to life model of the famous Mount Vernon Memorial road which is attracting considerable attention. This unusual model was constructed by engineers of the United States Bureau of Public Roads, who used 600 pounds of Savogran crack filler in the task of building up and surfacing the roads and landscape, and for covering the tree trunks to give the appearance of bark.

The completed model of the Mount Vernon Memorial road. Note how the details give realism.



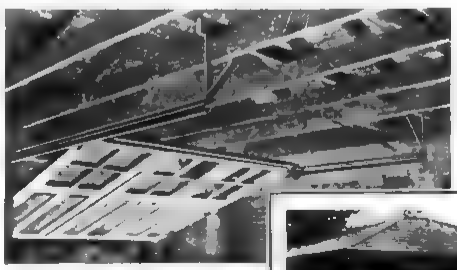
In constructing the model, the plan was laid out to exact scale and the surface built up to form the natural contours as shown in the photo.

In constructing the model, the plan was laid out to exact scale, as shown in the accompanying photo, and the surface built up to indicate the contour of the ground. Natural coloring and placing of trees, bushes, grass and the inclusion of all features of the landscape make the model remarkably life-like. Model bridges were even constructed and placed in the proper positions on the model.

New Space-Saving Door for Garages Lifts Open by Easy Pull on Handle

REPRESENTING the last word in durability, conservation of space, simplicity and ease of operation, a new garage door has recently been put on the market for installation in warehouses, filling stations, and private, public or apartment house garages. Instead of opening to the side or folding inward in the usual manner, which requires valuable extra space, the new door rises upward and inward on a pair of tracks suspended along the ceiling, as shown in the photos at right. The only effort required for opening is a slight pull on the handle outside. The same effect is accomplished from the inside by pulling another handle or by a gentle push with the foot at the bottom of the door, only three seconds being required for the entire operation.

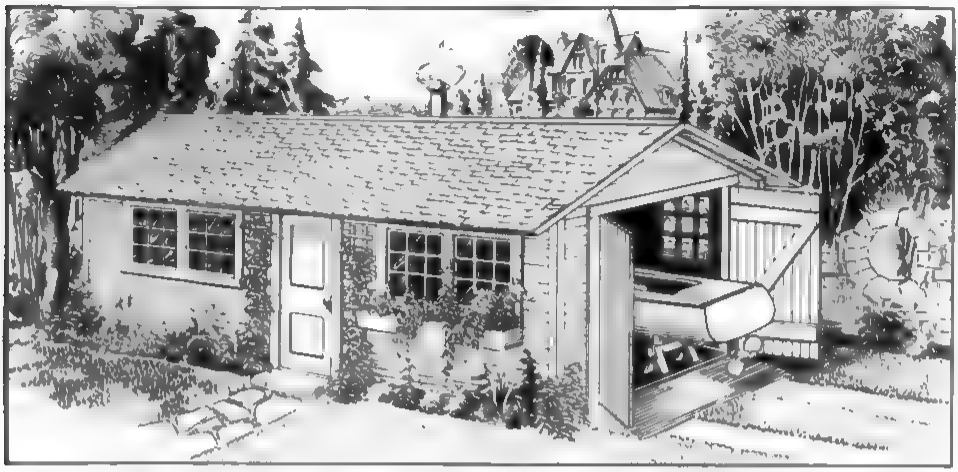
All parts of the door are made of wrought steel, thus giving a maximum of strength and durability. Lifting power is supplied by two huge heat tempered and oil tempered springs, which have twice the capacity required—a wide factor of safety. Operation of the door is so arranged that ample clearance is provided for the auto.



Top of the door slides along an iron track attached to the ceiling, and to which are fastened the pull springs.

When the handle outside or inside is pulled, this garage door rises upward and inward, as shown.

A Complete Home Workshop



The completed work shop is shown here. The end door permits building of boats or repair of autos.

by **HI SIBLEY**

A complete and well arranged workshop constitutes the most important factor in the home craftsman's world. So equipped, there is no project too difficult for accomplishment. Mr. Sibley describes herein a workshop which provides the utmost in convenience and completeness.

FOR turning out sturdy, neat, and durable work there is nothing more needful to the home craftsman than a complete and well arranged workshop. A shop that is laid out to provide the utmost in convenience, and that will have every piece of equipment necessary, from a paint brush bath to a lathe and forge, will aid the craftsman immensely in carrying out the most difficult projects, be it the construction of a bookshelf or motorboat. If you are so provided, there is no problem that can stump you, even the building of an airplane.

The workshop described herewith should enable the amateur mechanic to build an endless list of mechanical and household contrivances, as well as large pieces of furniture, motorboats, or gliders. It would even be possible to build small gasoline motors, steam engines and boilers of certain types, without resorting to larger shops, with the exception of foundries.

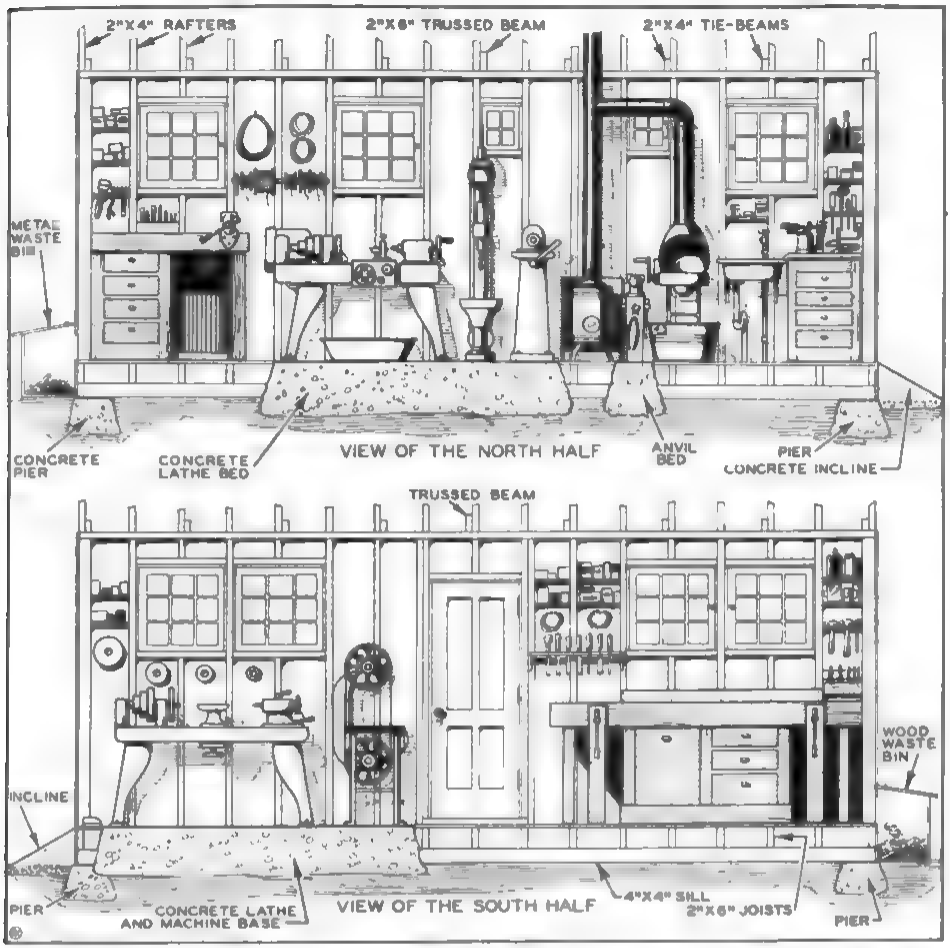
In the plans of this workshop, standard construction is employed throughout, using 4x4 inch sills on eight concrete piers, with two more under the central portions. Floor joists are 2x6 inches and studding 2x4 inches, spaced 16 inches on centers. Matched siding is preferred to shiplap, since it gives a smoother appearance to the interior, which is not sealed.

As soon as the floor plan is staked out, concrete beds should be made for the heavier machinery, as indicated, with anchor bolts installed to secure the machines firmly in place.

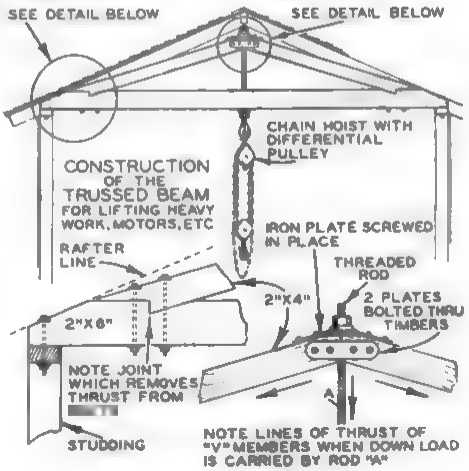
An important feature is the end door which permits taking out large assemblies, such as boats, airplane fuselages and wings. By making this opening 8 ft. wide it will admit your motor car. In this case, however, the anvil should be set on a movable base or in some other location.

The greatest convenience in having a shop of ample proportions is that a place can be provided for every tool. With little experience your hand will automatically reach to the proper place for any desired

Arrangement of Equipment in This Shop Provides Great Convenience



Equipment arranged as shown above will afford the greatest convenience. Right—Chain hoist suspended from the roof for lifting heavy weights.



item. The tools should be very carefully located around the carpenter bench, which will probably be used the most. Saws are ranged on a rack at the end of the bench, edge tools in racks on the wall, bolts, nuts, screws on shelves above, nails in a compartment box under the windows, hammers at the other end, together with planes, and paints and brushes above. The latter can be kept in condition by suspending in a bath of turpentine in the manner shown in the accompanying drawings. A bin beneath the bench, which pulls out like a flour bin, receives odds and ends of wood which may come in handy later. The drawers provide

Windows Are of Stationary, Casement Type, Which Are Easy to Build

These drawings show various details of construction. The shop windows are of casement type.

for special tools, partly finished small jobs, etc. A wiping rag, or towel, if you can persuade the household department to lend you one, is a great convenience if hung under the bench.

At the other end of the south wall is located the wood lathe and band saw, with shelves and pegs for extra equipment, such as sanding-disks, face-plates, gouges, circular saws, grindstones, and the like.

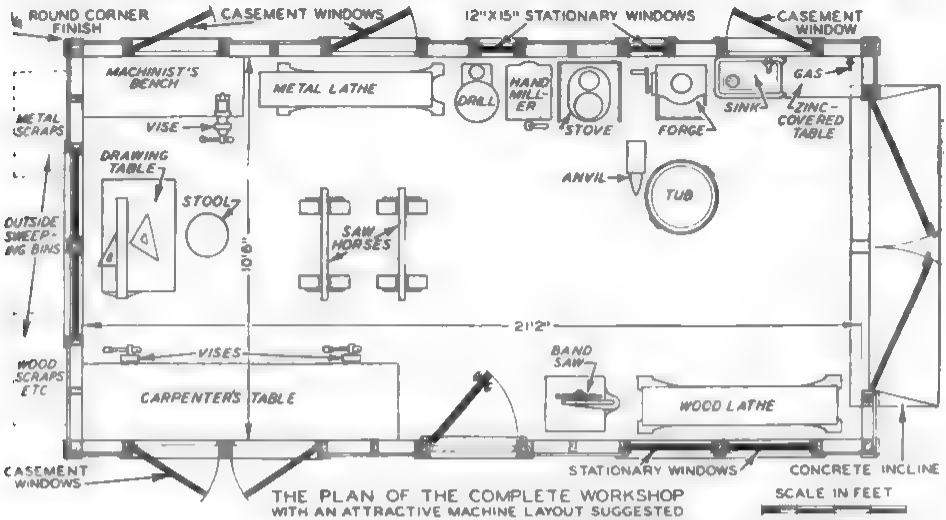
Along the north wall is ranged the heavier and more costly equipment. The lathe itself represents a considerable investment, but like all good investments, it will repay many times over the original outlay. And a good lathe is always the most economical in the long run.

There is a wide choice of drill presses, but one with a 16-inch swing should cover practically all requirements, since heavy boring can be done on the lathe. A hand milling-machine has been added as a special feature for milling keyways in shafts and similar work. A conventional machinist's bench has been equipped with drawers for tools and jigs not in frequent use, and will accommodate taps, dies, gauges, etc.

Even in the least ambitious of private shops there is frequent call for an anvil, and, of course, the forge has many uses in a complete plant of this nature. By all means install water connections and have a sink with drain, because it will save endless trips to the house or wall tap.

Adjoining the sink is a zinc-covered bench for soldering, for blow-torch work, and for heating small jobs when it is not advisable to fire up the forge. Gas connections, with a bunsen burner, help out in a great many jobs.

Under the good light of the west wall, place a portable drawing table for laying out your work and designing new contrivances. If this is an elaborate affair, drawing paper and instruments, together with



An ideal layout for the equipment is shown in the plans above, which provide for every need.

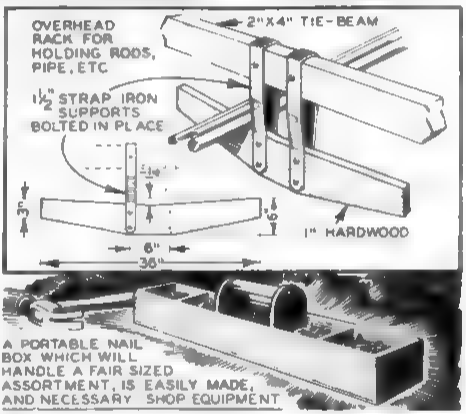
reference books, can be kept in drawers below.

Sweeping up has always been an annoying problem in most shops. But by building bins on the west end, outside, and cutting an opening about 12x12 inches in the wall at the floor level, sweepings are easily disposed of. The hinged lid of the bins permits removal from the outside when necessary. Along the rear or north wall build a covered rack to keep choice pieces of lumber dry, yet readily accessible.

As the windows are of the stationary, or casement type, no weight wells are necessary. Therefore the casing need be of the "face" type only. The cuttings for the windows are not made until the siding operations are begun.

Having decided upon the height of the windows from the ground, lay the siding up to this point. Fit one or two strips of siding flush with the inside edge of the studding forming the corner post of the casing, and then cut away the portion of the lower strip, down to the bevel, as shown in the drawings. Having the sill cut to allow for the thickness of the siding, cut through the studdings to be removed. The proper slant for the sill should be 1 inch in 6 inches. Set cleats in place on the end studdings to preserve the sill slant, and lay the sill.

Measure the window for height. This

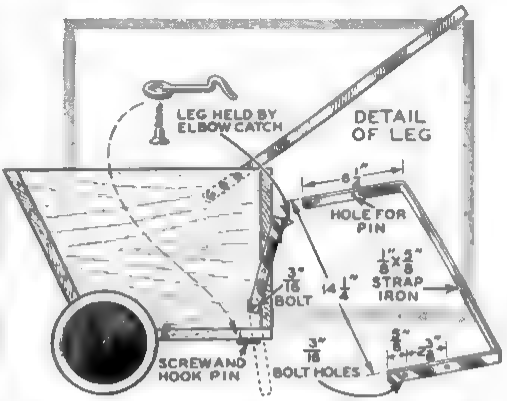


Pipe can be stored on a rack constructed as shown above. Nail box, also, is a handy article.

will give the length of the pieces "A" and "C". The width of "A" is equal to the width of the studding plus the thickness of the siding. The width of "C" is equal to the width of the studding only. Set pieces "A" and "C" in place with a good joint to the sill. Over the tops of these side strips, fit the pieces "B" flush with the outside edges of "A", and of the same width as "A". This piece determines the position of the 2"x4" beam supporting the continuation of the cut studding.

The siding may now be completed. When the siding is finished, the border strips are nailed in place, and the frames are ready for the installation of the windows.

Spare Parts Make Utility Cart for Doing Odd Jobs Around the House



Strap iron handle and leg of cart are fastened to the box as illustrated in side view above. The elbow catch and hook pin hold leg in position.

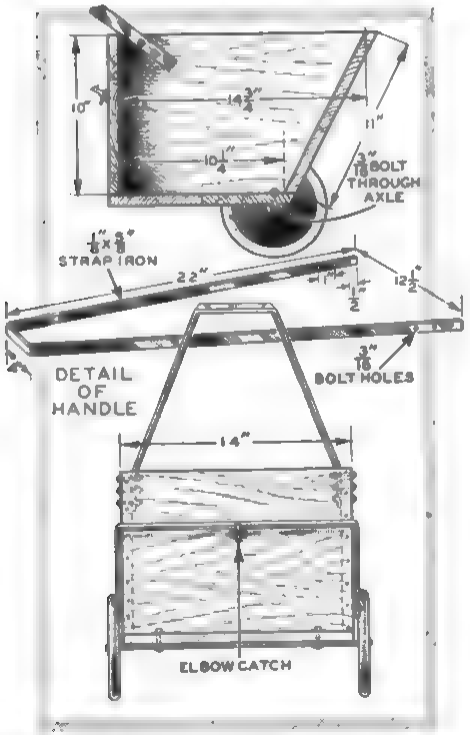
HERE'S an all-purpose cart that will sure come in handy around the house during the spring and summer. You can knock it together quickly out of inexpensive spare material and use it to haul earth or fertilizer for your garden or to carry groceries or laundry; and it will make a fine toy for the children.

The first job is to build the box, cutting the sides, ends, and bottom according to the dimensions given in the accompanying drawings. Nail the front and back boards to the edges of the side boards as illustrated in the side view above. Then cut two boards to fit the bottom of the box and nail them in place.

Now drill two or three 3/16 or ¼-inch holes through the wheel axle and through the box, and bolt this axle to the bottom. For the wheels you can use a pair from a broken coaster or other small wagon.

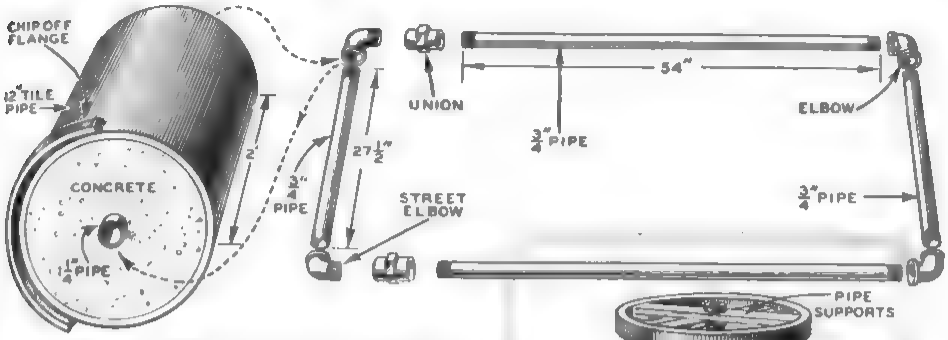
Your next task is to obtain two pieces of ⅛"x⅝" strap iron, one 48 inches long and the other 27 inches long. First bend the 27-inch piece, which serves as the leg, to the dimensions shown in the drawing above. Two 3/16-inch holes are then bored in each end of this piece, and it is bolted to the rear of the box as illustrated. A hook pin and elbow catch, bolted to the box, hold the leg secure when in support position or when unused.

Finally, bolt the handle piece to the sides as illustrated, and paint, lacquer or enamel the box according to your own ideas. It's a good idea to reinforce the box with steel corner braces.



Here's side and rear view, and handle dimensions.

This Home-Made Roller Keeps Your Lawn in Good Shape



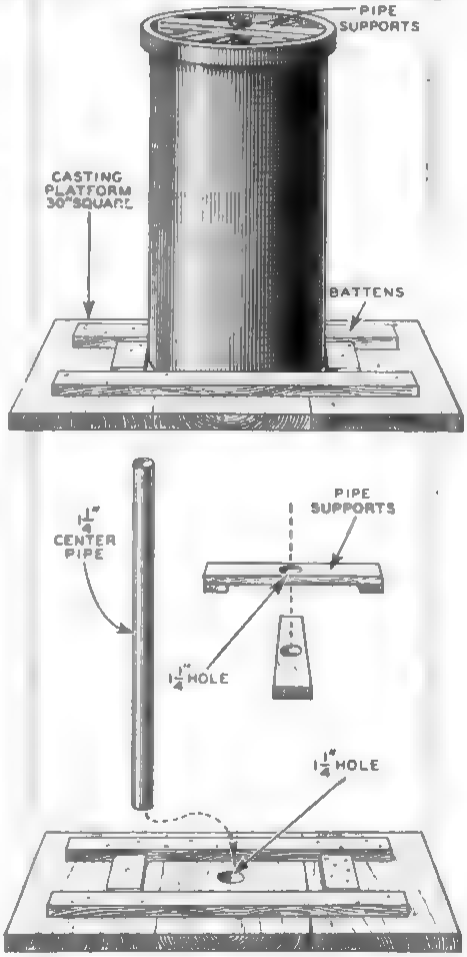
Pipe, unions and elbows are assembled as shown in above drawing to make the handle. The flange on the tile pipe can, of course, be chipped off either before or after the pipe is filled with concrete.

IF YOU have on hand the task of keeping the lawn, tennis court, driveway, etc., smooth, you will find this inexpensive, easily-made roller just the thing for the job. It will last you almost indefinitely, and all you will need to build it is the following material: One 2-foot length of 12-inch vitrified tile sewer pipe; one 26-inch length of 1¼-inch pipe; four pieces of ¾-inch pipe of dimensions given above; two street elbows, two 90-degree elbows, and two unions. Also, about one wheelbarrowful of crushed stone, three-quarters barrow of sand, and one-quarter sack of concrete cement; and boards for casting platform.

The first step is to build the casting platform of the dimensions shown at the right, with a 1¼-inch hole in the center. Then place the tile, which has its flange chiseled off, on this platform, and secure it with battens as shown. It is essential that the tile be perfectly centered around the hole.

Next insert the 1¼-inch center pipe in the hole in the platform, and support it at the top with the two cross-pieces shown. This much done, you are ready to mix the concrete, which should be made with one part cement, three parts sand, and four parts stone, with enough water to make it pour readily. Tamp the mixture down compactly against the inside of the tile pipe and against the iron center pipe. Allow the form to stand for about forty-eight hours before disturbing it.

The drawings above show the assembly of the pipe and fittings for the handle. The frame, when completed, should be given a coating of asphalt paint. The glazed surface of the pipe will be found excellent for rolling.



The casting platform for pouring the concrete into the tile is constructed as illustrated here. The 1¼-inch pipe should come exactly in the center of the tile to make the roller run evenly. The battens hold pipe centered on casting platform at bottom, and crosspieces center pipe at the top.

Paper Bag Makes Emergency Kettle for Heating Water

Water is boiled by holding the sack over the gas burner. The water immediately conducts the heat away from the paper so that bag does not catch fire.

THE next time you want some hot water, and have none on tap nor any kettle to boil it in, try this simple little stunt. Simply obtain a paper sack made from fairly thick paper, fill it with water, and hold over a gas jet or burner for a few minutes. Although it seems impossible, the water will quickly come to a boiling point, and the bag will not burst out in flames because the water immediately conducts all the heat away from the paper.

You will find this little stunt particularly helpful when you have to put up at some small country hotel that does not provide running hot water. When shaving time comes, simply procure a bag, and the hot water will soon be forthcoming.

Animal Glue Makes Chipped Glass

THE story of the manufacture of "chipped glass," that opaque glass which both admits light and provides privacy, is suitable for comment by Bob (Believe It or Not) Ripley. The glass is first cleaned thoroughly, then covered with a solution of animal glue. This glue sinks into the pores of the glass and dries. While drying it shrinks and due to its great adhesiveness actually pulls away chips of the glass, thus creating the irregular surface which serves to diffuse the light and render the glass non-transparent.

Decorate Pillow from Paint Card

Large celluloid paint-sample pieces, obtained from paint store and glued to cover decorate this pillow.

AN attractive pattern and coloring may be produced on a leatherette cushion by glueing paint - sample pieces to the cloth backing, as illustrated at the left. The samples, which can be obtained at most any hardware store, should be of large area.

Archery and Poker Game in One

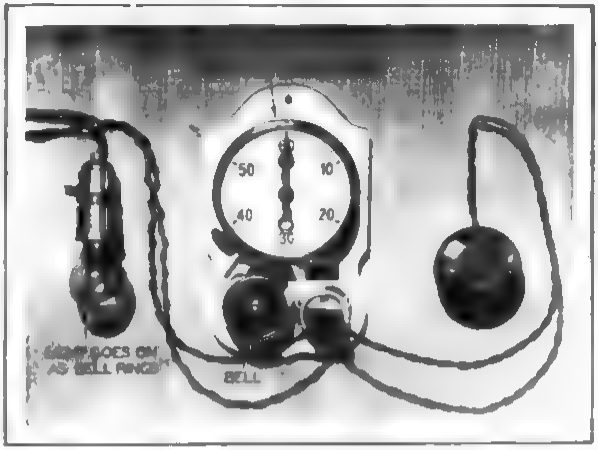
This game combines archery and poker, the player shooting arrows into cards on target to score.

POKER and archery are combined in a new game that has a target on which are painted all the cards of the poker deck, as shown in the photo above. Points are scored by shooting five regular arrows into the cards to make four aces, a full house, three of a kind, or whatever your shots draw. The young lady in the photo above, Miss Helen Thompson, wintering at Ormond Beach, Florida, has just shot three aces and a pair of kings—a winning hand.

Electric Alarm Clock Turns on Light as the Bell Rings

AN ELECTRIC alarm clock, which not only shatters slumber by the usual raucous bell but also turns on the light, has been invented by a well known firm of German clock and watch manufacturers. When the alarm rings the bulb lights up automatically, dispersing whatever slumber the ringing may not have interrupted.

The clock should be a boon for those who arise before daylight, as the light will prevent much stubbing of toes in the darkness while dashing across the room to shut off (or throw out) the clock. It should only be a step now to the time when the clock will turn on the heat.



Electric alarm clock may be plugged in on house current.

World's Smallest Elevator

Lindbergh Beacon keeper in smallest elevator.

THE world's smallest elevator is used by Clifford Liably every night and morning to ascend to the Lindbergh beacon which is mounted atop the Palmolive Building in Chicago. The can he is carrying in above photo contains the night's supply of carbons.

Autogiro Planes to Fly 200 M.P.H.

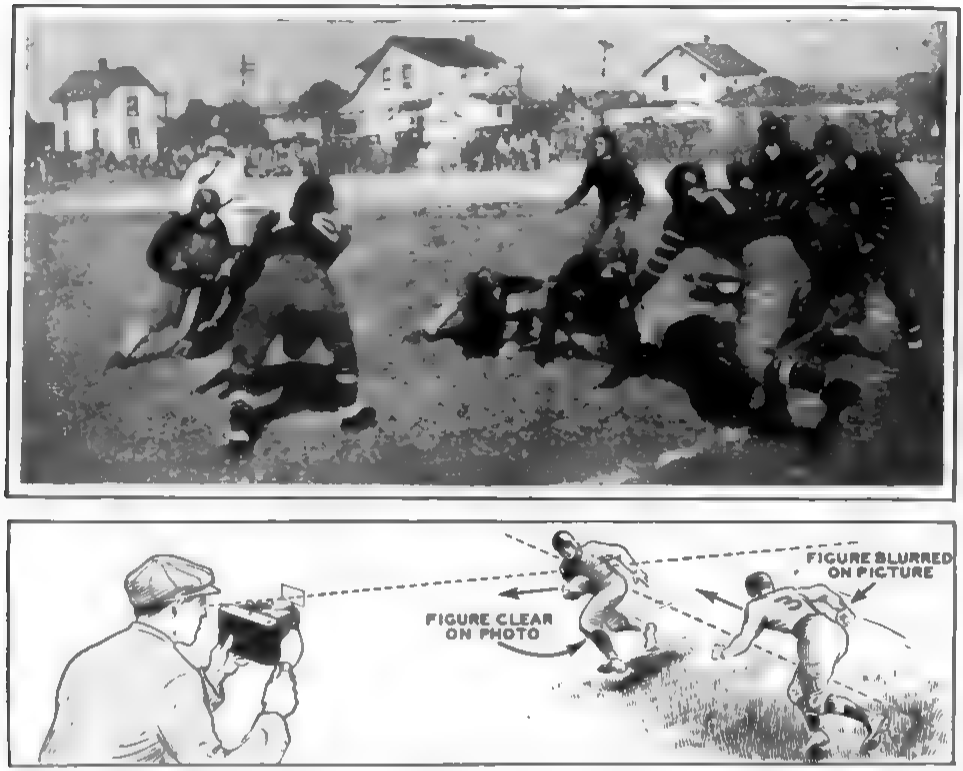
JUAN DE LA CIERVA, inventor of the Autogiro, predicted recently that vertical flying planes of the future will be able to develop a speed of 200 miles an hour and have a carrying capacity of six tons. Landing fields of extremely small dimensions will be used when the prediction comes true.

Hunter's Glove Leaves Fingers Free

A HUNTER'S mitten now on the market has the right or left palm made with a special fold-back flap that permits the free use of all fingers and allows the wearer to have perfect control of a gun without removing the mitten. When the fingers are withdrawn into the mitten the flap is closed, thus providing the usual warmth. The mitten can also be used by fishermen during cold weather.

Flap allows hunter to use fingers while wearing glove.

Handling Your Camera to



Photographs of moving figures will be clearest when the direction of motion is away from or toward the cameraman. Figures moving rapidly across the scene, as illustrated above, usually turn out blurred.

by

WALTER E. BURTON

IF YOU have a camera of any kind you are eligible to participate in one of the world's most popular and fascinating hobbies—amateur photography. The real thrills of photography—the thrills that have made the camera art popular for generations—come, however, not from just "shooting" everything that looks interesting, but from carefully sizing up your subject with regard to composition, shading, expression, motion, etc. If you consider these artistic qualities in making your photos you will find that there is a new world of interest in your hobby, and you will have pictures that you will always be proud to show to your friends.

In taking up this hobby the first steps will be the selection of a good camera, if you do not already possess one, and then the consideration of the manner of using it properly to make the finest pictures.

"What kind of a camera should I use?" is the logical question you will ask, especially if you plan to purchase one. It really is not essential to have a high-priced instrument, although it is a good rule to obtain the best that your pocket book permits, if you expect to make photography more than a passing fancy. But good work can be done with a box costing a dollar or two. An architect recently toured Europe photographing build-

Make Pictures that "Live"

You can make photographs that are artistic as well as interesting if you employ the methods given by Mr. Burton in this article, which instructs you on important points of the camera art.

Best perspective for a picture is obtained by holding the camera at eye level, as demonstrated here. This position also permits better sighting of the camera.

To get interesting pictures and avoid unnatural and artificial poses, snap the camera when the subjects are unaware they are being photographed, as in the top picture. From the standpoint of interest, compare this ideal picture with the posed photo below.

ings with a camera that had no lens at all—merely a pin hole in front! He did this to obtain pictures absolutely to scale, so that he could reproduce portions of the structures later in his work.

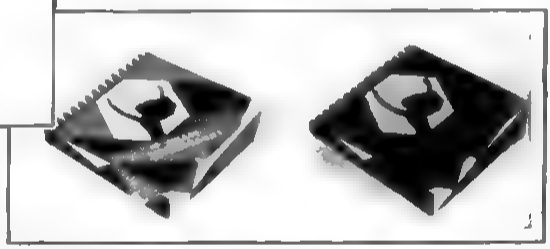
Size is largely a matter of taste. The 2¼x3¼ in. print is about the smallest that is satisfactory for all-round purposes. A larger size is better, but, of course, more costly. The more nearly square a negative, the better it will enlarge, because long, narrow enlargements never look pleasing except in special cases. Thus a 2¼x3¼ in. size negative is preferable to a 2¼x4¼ in.

It makes little difference whether you employ roll film or packs. Each has its advantages. The pack is convenient when you want to develop a film before the remaining ones in the group are exposed. The roll is more popular among amateurs and is often more easily obtained than packs.

You doubtless have heard much talk about lenses. The cheaper cameras have, of course, cheap lenses which contain a number of faults that are permissible for ordinary "snapshooting" in good light. They are comparatively slow, and usually are fixed at one distance from the film—fixed-focus, in other words. The better lenses, the anastigmats, are more highly corrected for removal of

Pictures too light or too dark result from incorrect exposure. Negative at top has been overexposed, resulting in unnaturally dark shadows. Bottom negative has been underexposed, eliminating all but most prominent features.

Another good way to get a picture that "tells a story" and that is not obviously posed is to surprise your subjects and snap the camera before they have time to assume an artificial expression. The photo above catches a natural expression.



Note in the photo at the left above how correct exposure produces clear-cut lines in the design of the box. Photo at right was overexposed, merging all details into dark tone. Pictures can be partly saved by under developing.

their inherent faults, and are speedier. If possible, obtain a camera having an anastigmat lens. You will get better pictures, especially when light is poor. All cameras with anastigmat lens are accompanied by instruction sheets and exposure tables.

Correct exposure is the first secret of good pictures. The intensity and quality of light, the color of objects, the time of day, the kind of film you are using, and the manner of subsequent development all enter into the problem, so that the matter of exposure seems at first glance like a hopeless tangle. The film and its development need worry you but little, however; your chief concern is the light. You can learn, by trial and error methods, to judge exposure quite correctly. In fact this will become second nature after a time. But you will be wise to follow closely an exposure meter, or chart, such as provided in this article.

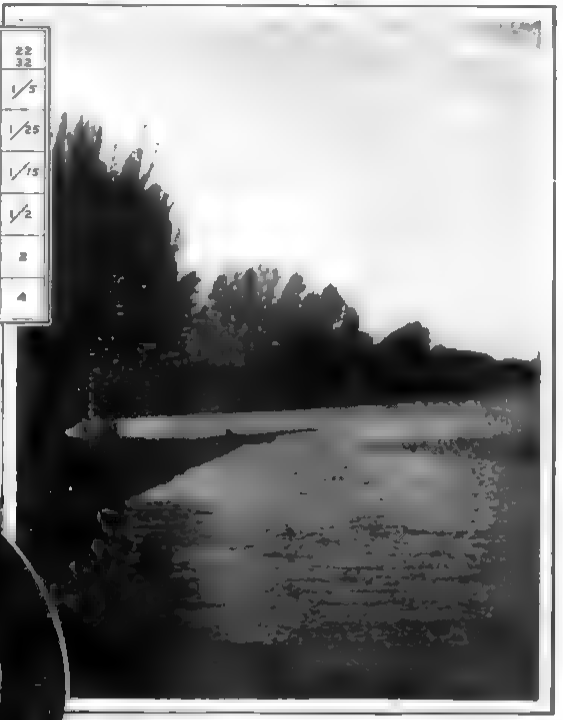
The charts will enable you to estimate with fair accuracy the exposure—the combination of lens opening and shutter speed—according to the conditions in which you are working. On some cameras, a simplified exposure chart is placed on the shutter front. Exposure meters that measure the intensity of the light are quite accurate, but, unfortunately, are relatively expensive. But regardless of the type you use, you will find it a film-saver if you manipulate it correctly.

If you still are in doubt about the time to give, make the exposure long rather than too short. An overexposed negative is more easily salvaged than an undertimed one.

LENS OPENING F NO. U.S.NO.	4.5 —	6.3 —	8 4	11 8	16 16	22 32
STREET SCENES, NEARBY OBJECTS, FIGURES.	1/50	1/100	1/50	1/25	1/15	1/5
WATER SCENES, LANDSCAPES WITH LIGHT FOREGROUNDS, ETC AL SO SHOW SCENES	1/400	1/200	1/120	1/50	1/25	1/25
OPEN SEA, CLOUDS, SKY	—	—	—	1/300	1/150	1/75
SUBJECTS WITH DARK FOREGROUND, GROUPS, TREES ETC	1/100	1/50	1/25	1/10	1/2	1/2
FOREST SCENES UNDER TREES, BUILT-UP STREETS, ETC.	1/10	1/5	1/5	1/2	1	2
PORTRAITS INDOORS WHEN LIGHT IS GOOD	1/2	1/4	1/2	1	2	4

This exposure table shows you how to adjust shutter speed and lens opening of anastigmat camera in bright sunshine. With heavy clouds give 3 times the exposure; dull light, 5 to 10 times.

Best pictures are made with an anastigmat lens of the type shown above. Top lever regulates shutter speed; bottom lever, lens opening; while dial around lens adjusts the camera for distance.



This picture illustrates what is meant by pleasing composition. The shore line has a graceful curve, the lighting is interesting, and the clouds make attractive an otherwise blank sky.

Most amateur negatives are undertimed and then overdeveloped, so that, when prints are made, the shadows and darker portions are dense black while the lighter areas are nearly white, the picture as a whole being unsatisfactory.

Another error the new camera owner is likely to commit, especially with the fixed-focus box, is in getting too close to the object he is photographing. Read your instruction book carefully and learn the minimum distance at which the lens brings an object into sharp focus. Then do not approach any closer than this. If you have a focusing scale, get acquainted with it. This scale indicates where you must set your lens, in relation to the film, to photograph an object 10, 50 or a hundred or more feet distant. Most lenses, when set at "infinity", will record sharply any object not nearer than 100 feet.

Do not expect too much from your first few rolls or packs. You will probably spoil most of them, but by doing so you will learn much about using your camera.

You doubtless will notice, if you are observant, that a portrait made in the shade or on a cloudy day is much better than one made in the direct sunlight. The eyes, the real centers of interest, are plainer, and the face features are not mere masses of white and black. Of course, a longer exposure, which means either a slower shutter speed or a larger lens diaphragm opening, is required in the shade; but that is not objectionable if you have a firm support for your camera. No shutter speed lower than 1/25 of a second should be used when the camera is held in the hand.

(Continued on page 209)

Miniature Inclined Railway Saves Uphill Walk to Home

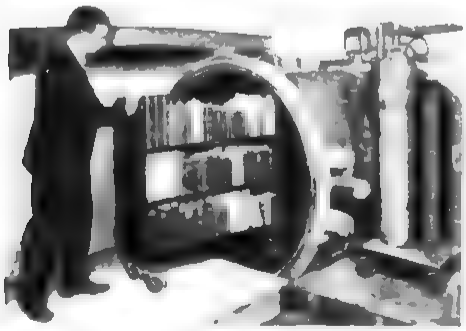
The tracks of this diminutive inclined railway are made from one-inch angle iron. Two front flanged wheels of the car are larger than rear ones to keep carrier level.

WHAT may amount to the world's smallest and steepest inclined miniature railway has been built by Mr. Charles V. Maris, of Los Angeles, to save himself and his family the tiresome task of carrying bundles up and down the steep flight of steps leading from the street to his house on the hill. The track, built at a 45-degree angle, is made of one-inch angle iron.

The car is operated by a cable wound on a drum attached to an electric motor as shown here. Switches to control the motor are located at both ends of the track.

Loud Noises Harmful to Eyes

ONE of the most harmful effects of loud noises is the decrease in the field of vision, it was recently discovered by an eminent Russian scientist. Normal people do most of their seeing with a tiny spot at the center of the retina, or nervous membrane, at the back of the eye ball, and when noise of any kind enters the ear this field of vision, as it is called, is narrowed considerably. The reduced field of vision may have disastrous effects when a person is in a place where clear-sightedness is necessary for safety, as in a crowded city street.



Bookworms are exterminated in this vacuum cylinder with new fumigating gas, harmless to books.

New Gas Rids Books of Worms

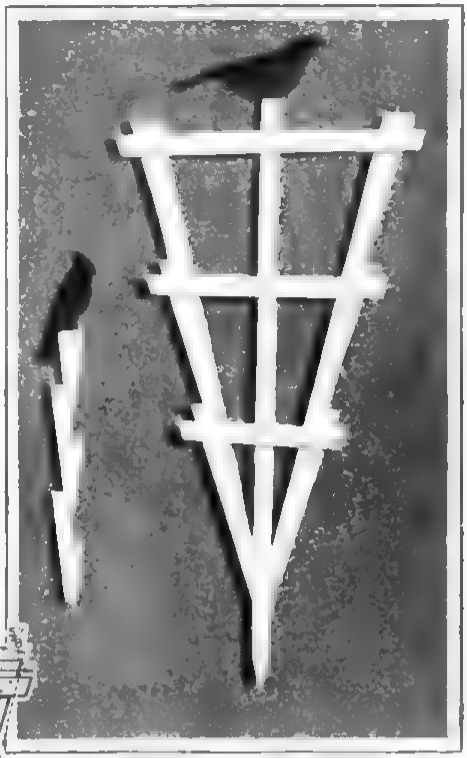
BOOKWORMS of the literal species met with a decisive defeat at the hands of bookworms of the figurative species recently when scientists developed a new fumigant for destroying the pests that prey on the printed pages.

In this scheme for ridding the books of the destructive insects, the tomes are placed in a rack and shoved into a vacuum fumigator resembling a huge cylinder, into which a recently developed suffocating gas is admitted. This new gas, unlike the other fumigants, does not in any way injure the books, and is not inflammable. This scheme is now being used by Huntington, Cal., library.

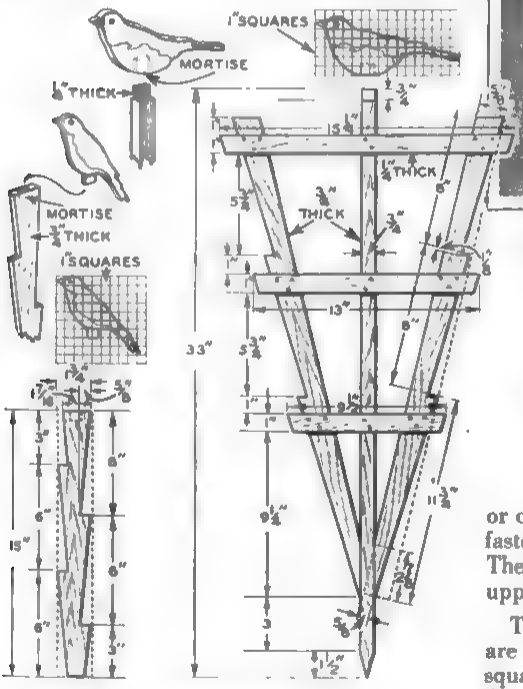
Decorate the Garden With These Ornamental Bird Racks

STICKS and racks for the support of flower stalks, shrubs and vines are necessary garden accessories, and while any sticks, used singly or nailed together to form frames will serve the purpose, there is as good a reason for making them attractive as there is for keeping beds weeded and trim. Indeed, nicely designed sticks and racks, lacquered or enameled in harmony with the planting color scheme, give to the garden touches of individuality which most garden lovers are keen to attain.

The accompanying drawings and photos show two ornamental garden sticks, both surmounted by jig-sawed wooden birds. Both are of modernistic design, with set-backs for holding the vines more securely. An excellent small size rack is shown at the right in the accompanying photo. It is made from ¾-inch stock, and cut to the dimensions shown in the drawing below. A mortise is cut in the top to take the tenon of the bird or other ornament which surmounts the stick.



These ornamental racks, used to support vines or shrubs, will add to garden's attractiveness.



The various parts of the bird racks are cut to the dimensions given in the above drawings. The birds which surmount the racks are attached by means of mortise and tenon joints, as shown. Designs for the birds are first traced on squared paper and then outlined on the wood blocks which are then cut out with any coping or scroll saw.

A design for a larger and more elaborate rack is also given in the accompanying drawing. The vertical and side pieces are made from ¾-inch stock, and the horizontal pieces from lattice strips, or other ¼-inch stock. The various parts are fastened together with three penny nails. The center upright has a tenon cut on its upper end to fit the mortise in the bird.

The birds which surmount the two sticks are shaped by first tracing their designs on squared paper, as shown in the drawing, and then outlining this form on the wood to be used. Next cut around these lines with a scroll or coping saw to form the finished figure. Of course the coloring will be conventional rather than naturalistic, but you can use your own ideas, both in shaping the figures and in painting them.

Gay Envelope Linings

Some parchment, a bit of wire and paste and a handful of those multi-colored envelope linings will make this attractive lamp shade. The author points out too, a few suggestions on decorating waste baskets and boxes.

THOSE gay colorful linings that come with fancy holiday envelopes need not be concealed from all eyes—they can be utilized to decorate lamp shades, waste baskets, match boxes, and a number of household decorations that serve as more of an ornamental than a practical purpose. A lampshade decorated by these linings is shown at the top of the page. It is highly ornamental, very inexpensive, and easy to make.

It is first necessary to procure a frame for the shade. Wire frames for droplights that can be purchased at any ten cent store will serve the purpose very well. The size you will need will depend, of course, upon the size of shade you want to make.

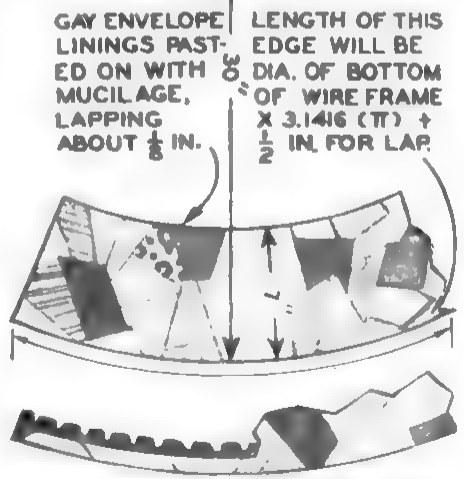
Parchment paper is used to cover the frame. Determining the proper shape of the paper is a necessary item in the layout of the shade. The layout is a simple matter, however, if the method illustrated at the bottom of the page is followed. First take two yardsticks and hold them as shown in the photo at the top of the next page. This will give the radius of the circle to be inscribed in laying out the shape of the paper.

In actually laying out the paper, a compass can be made by tying a string to a pencil. The length of the string will be the radius of the circle to be inscribed. The length of the lower edge of the parchment can be determined by wrapping it around the wire frame. A half inch or so should be allowed for overlapping. The width of the paper will, of course, be the width of the frame.

When you have cut the parchment to shape the next task is to paste on the decorative envelope linings. This is done by covering the entire surface with mucilage, and laying on the linings in sections. The arrangement of the linings will depend upon your own ingenuity at design. There is no definite formula to follow in this matter. It is all a matter of taste and a sense of design.

When the parchment paper is completely covered and dry, fold it around the wire frame and paste the lap. Secure the upper and lower edges with black and other colored pebbled passe-partout folded double with the gummed side in, as shown at the bottom of the page. A neater fit will be achieved by slitting the inner fold at intervals.

When this is finished apply a coat of clear shel-



BLACK PEBBLED PASSE PARTOUT IS DOUBLED, THE INNER FOLD SLIT AT INTERVALS AND PASTED OVER WIRE FRAME AND PARCHMENT.

Decorate Lamp Shades

by HI SIBLEY

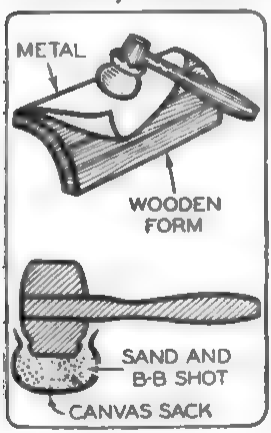
lac over the outside surface. This gives it a gloss, holds the colored paper on, and permits cleaning without damage.

A neat and unique base for this lamp shade can be made from a liquor bottle. Old bottles that were used to contain liquor back in the day B.P. (before prohibition) are growing quite popular for this purpose. Transparent bottles can be filled with dyed water to give color and solidity to the base. The light socket is mounted in the top with a special fitting.

These envelope linings can be used as well to decorate waste paper boxes and match boxes. The method of pasting linings is the same as the method specified above.

When laying out the shape of the lampshade paper, the radius of the circle is determined as shown above. The length at the apex of the yardsticks is the radius of the circle.

An Easily Made Soft Head Mallet

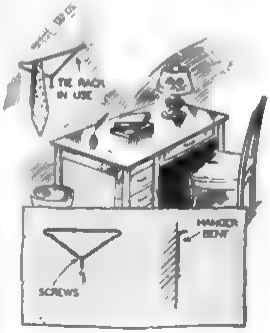


Canvas is filled with sand and shot as shown above.

A MALLET that has a firm but not solid head for beating out such metals as sheet lead can be made by following the drawing at the left. A small circle of canvas is cut out of a desired size and filled with a mixture of sand and BB shot. Then a groove is made in the head of an ordinary mallet. The canvas sack is bound to the mallet head by winding wire around the groove and the canvas. This makes a serviceable mallet where padded blows are required.

Tie Rack from Wire Coat Hanger

OLD wire coat hangers which cost so little, can be used by an ingenious handicraftsman to make a serviceable tie rack at practically no cost whatever. The hanger is bent and screwed to the wall as shown in the drawing at the right. The hook portion is cut off with wire cutters and filed away neatly. A dozen ties can easily be accommodated.



Hanger bent to shape as shown makes good tie rack.

German Police Dog Made Red Cross Member for Heroism

REX, a German shepherd dog, is the only canine in the world to be made an honorary member of the American Red Cross. The dog received his membership by saving the lives of several drowning girls by the method shown in the photo at the right.

Rex, the German police dog, is shown here demonstrating his method of saving a drowning girl.

Note the alert, intelligent look of Rex, who is shown above beside his mistress at the beach.

Birds' Glands Make Them Migrate

SOME time ago Professor Rowan, of the University of Alberta, Canada, formulated the theory that birds migrate northward in spring and southward in fall because of changes in their body glands brought about by the increasing or diminishing length of daylight during the various seasons.

By producing artificial daylight and thus altering the natural conditions under which birds live, he caused their glands to change, so that the birds flew blindly northward in the middle of winter to face starvation in frozen country instead of southward, as would have been natural to them had their glands been functioning normally.

Explorers Use Mercy Bullet

CAPT. Barnett Harris, head of the Harris Zoological expedition to South Africa, has perfected an invention, known as the mercy bullet, which puts wild animals to sleep through a hypodermic charge in the head of a bullet. By this means he avoids wounding or killing the rare specimens of wild animals which he captures on his expeditions in strange lands.

The mercy bullet is fired from a gun like any other bullet, and when it strikes the animal he goes immediately to sleep. By the time he has awakened from the anaesthetic he is safely bound and already one of the explorer's collected specimens of wild life.

Captain Harris has collected a priceless aggregation of undamaged pelts and living specimens in this manner.

Using the mercy bullet, the head of which was filled with a chemical that acts as a hypodermic, experimenters brought down this sheep painlessly.

These Flower BEDS ARE Novel

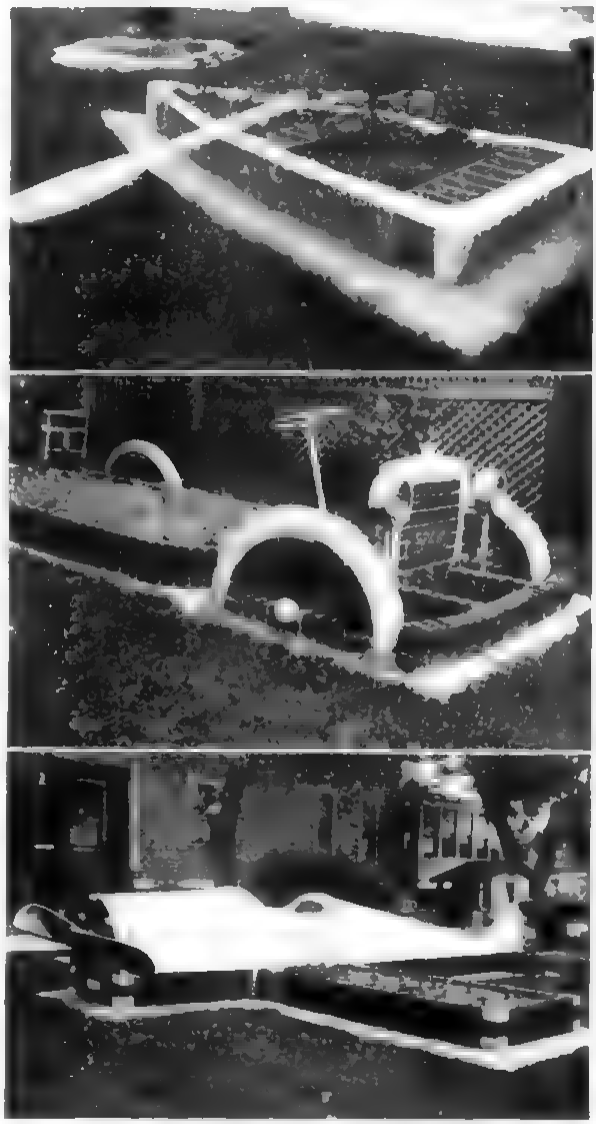
YOU would hunt far and perhaps in vain, to find more novel flower beds than W. F. Wilke, of Omaha, has made for the vacant corner lot beside his home. At the first glance, the area seems to be actually cluttered up with odd and elaborate designs—which on second glance appear to be flower beds. Mr. Wilke naturally disliked to estimate the time he has spent on them. One knows the hours have been many. Yet the completed task is one of permanence and distinction.

Mr. Wilke is a brick mason. Naturally he turned to brick as the material from which to construct his various ideas. In between the beds the ground is perfectly turfed with blue grass. Nor do the few accompanying photos show all, by any means, of the clever things found.

Facing the street and of the most prominence is the airplane bed. The fuselage frame is of brick with tin covering most of the curved portions. The "prop" in front is genuine, having been donated by a flyer from a ship which cracked up. The wings become the beds proper as you see. Around the bed is a facing 5 inches wide of concrete. The cockpit is well formed and the rudder is of brick. Each side the rudder are two small flower beds to resemble the elevator pieces.

Farther back we find a row boat, oars in place, full of flowers. The sides are of brick, the seats of tile. Concrete caps the edges to give a rounded surface. This bed, too, rests upon concrete set flush with the ground.

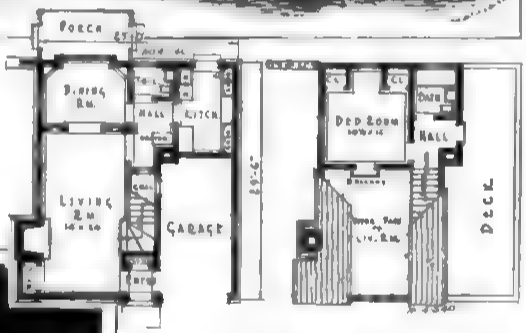
Perhaps the most amusing of all beds is the auto. There is the steering wheel, head lights and portions of actual tires, to say nothing of the license plate, hub and radiator caps to lend realism. The rest of the creation is of brick on edge. Although this auto flower bed was put in 5 years ago, it looks as though the mortar had hardly dried. Of course, the tires extend only a little way below the concrete foundation.



At the top is a brick rowboat with concrete oars and tile seats. In the center is an auto flower bed with real lights, tires and steering wheel. Below is the airplane bed which occupies the most prominent place in the yard. The propeller is real.

Will your New House Have "It"?

"IT" is the outstanding quality of this distinctive Irish style cottage, which combines Old World solidity with American boldness. Built from plan No. 4-S-40, it has an unique studio living room with heavy exposed rafters and Romeo and Juliet balcony. A thatch roof and stone chimney give exterior attractiveness.



Irish Cottage floor plans, No. 4-S-40.

Here is an interior view of the commodious Irish cottage living room, which is flooded with sunlight from the high mullioned window. Plans for this house can be had by mailing $1.00 to Modern Mechanics Home Building Editor.

WHEN Elinor Glyn headlined the word "it" she made it easy to sum up in a term that indefinable something that gives people lure, charm and seductive qualities; that makes them movie stars, spotlight actors, magnetic leaders and front page news.

Houses, like people, also have "IT" —or, rather, they have "IT" or—they don't. There's seldom if ever any middle ground. Some people are born with charm, talent and personality. Others cultivate it. Not all of us are in this gifted class. But when you

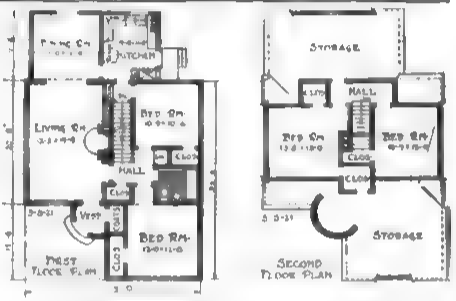
by

Maurice I. Flagg

HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, HOMES FOR NEWLYWEDS, containing 32 of the latest ideas for low cost homes in all styles, and 16 SELECTED HOMES FOR LEAN PURSES containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn., for blue prints and plan books.

This picturesque house, with its tower and casement windows, introduces a new note in designs for small homes.



First and second floor plans for the tower house, No. 5-S-21, are shown in the drawing above.

come to houses, new houses especially, you can build all the "IT" qualities and features you want.

By remodeling an old house of overweight appearance and ungainly lines you can often remake it into a graceful, modern dwelling. Present day tendencies in houses, like current fashions in physical appearance, are along lines of reduction from overstuffed stylish stout effects to slim, sleek, speedy, greyhound lines.

Will Rogers once described "IT" as "checks appeal". In some houses where money is spent lavishly the qualities of romance, lure and charm do come at high prices, and you require a fat checkbook. But all is not gold that glitters. How you plan and build is of much more importance than what you build. If you follow that rule you can have a little house radiant with charm and personality.

The two designs I have selected for this issue have many "IT" qualities and they can be built for prices well within the range or appeal of average checkbooks. Study them.

House No. 4-S-40 is a design in Irish style. In this style cottage the designer has merged a dash of the old world solidity with American daring and produced a touch of originality—a house full of "IT" qualities.

Here are some of the seductive features: A Romeo and Juliet balcony opening from the bedroom and overlooking the living room; a studio living room with high ceiling and exposed rafters; a thatch roof and native field stone chimney; a vanity alcove in the bedroom; a bed closet next to the living room fireplace; a dining room floor raised one step above the living room floor level; a high mullioned window permitting a flood of sunshine and light to enter the living room; an open stairway from first to second floor. In fact this house has so many fascinating features that it would give an interior decorator heart throbs to visualize the many picturesque effects possible in the way of furnishings.

To keep the cost down, you can build the house without a basement if you wish. This may save from $500 to $700. If you prefer a cellar, you may have one. Stairs will descend where the heater and fuel rooms are now located.

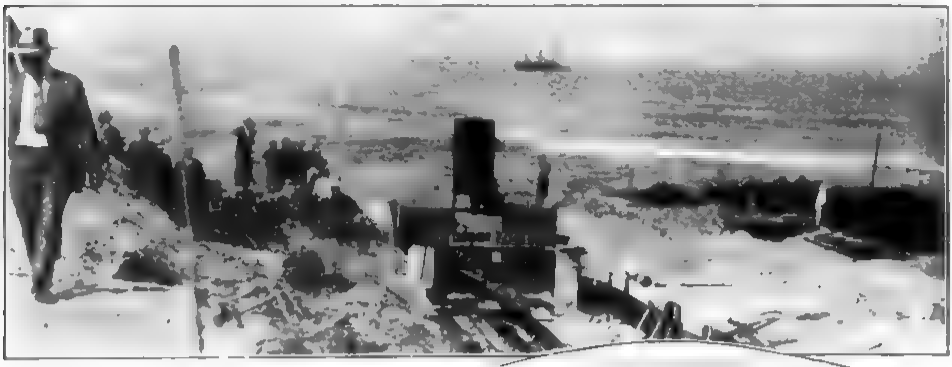
The bed closet in the living room does two interesting things. It offers emergency sleeping equipment. And it also makes the house a complete bungalow equipment on the first floor. A toilet located between kitchen and dining room is a convenient feature.

A first floor heater will provide adequate warmth. If you prefer a basement heater, a partial excavation may be sufficient.

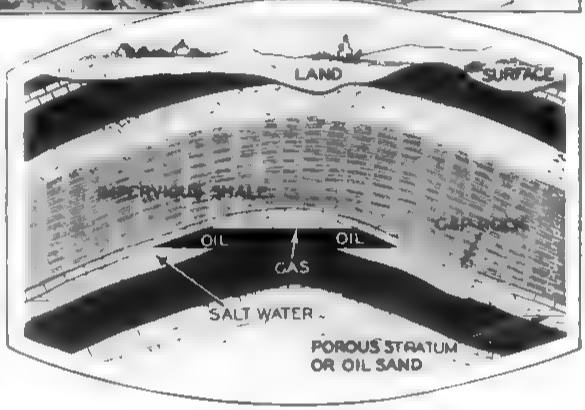
On the second floor there is one bedroom and a bathroom. Notice the vanity alcove between the bedroom windows. Women will

(Continued on page 196)

Origin of Petroleum Is Still Disputed Among Geologists



One method of transporting petroleum is pictured above. An undersea pipeline connects the ship with the shore.



Typical oil deposit in the earth created by decomposed matter.

THE origin of crude petroleum, that black, gummy liquid, often termed "liquid gold," that serves such a multitude of purposes in our modern civilization —which is, in fact, indispensable— is a subject that still evokes considerable discussion among geologists. It is most generally held that this liquid which in a refined form runs our automobiles, heats our houses, drives our airplanes and ships, to mention only a few of its uses, is the product of decomposed organic matter, either vegetable or animal, the decomposition having taken place under high pressure and at low temperature in the absence of air.

Those who hold by this theory of the organic origin of petroleum differ among themselves, some believing that vegetable matter is the basic material in the formation of the liquid, others believing that the dry distillation of marine animals produced the petroleum deposits. Still others believe that the distillation of bituminous coal at high temperatures produced petroleum vapors, and that later these vapors were condensed at some distance from the point at which distillation took place, leaving anthracite coal as a residue.

Those who favor the other theory, the inorganic origin theory, believe that petroleum resulted either from the action of steam and carbon dioxide upon alkali metals, such as sodium, or that petroleum was generated by the action of water upon certain metallic carbides, such as iron carbide; and that consequently petroleum vapors and iron ore deposits were formed. This latter theory is based upon the similarity between acetylene and petroleum, for it is commonly known that acetylene is the resulting product of the reaction between calcium carbide and water.

Once the precious liquid is extracted from the bowels of the earth, where it is found, as shown in the diagram above, the problem then arises of transporting it to points where it is to be refined or used. One method of transferring the liquid from an oil tanker to a point ashore where there are no docking facilities is shown in the photo at the top of the page. A welded pipeline thirteen inches in diameter and a half mile long was laid out in the bed of the ocean, terminating at that end in an anchored buoy, and at the shore end in a pumping station. Steamers navigate as far as the buoy and there fasten their discharge hose.

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Smashing Down Skyscrapers

(Continued from page 56)

olis works today he is not conscious of the existence of objets d'art in some mansion, neither is he preoccupied with the hope that his bar or pick is going to uncover some hidden treasure. It is plain, downright smash, crash, tear down and cart off. Invariably, the whole kit and kaboodle of a structure we tackle goes gallivanting off to the ocean or to the meadows of Long Island to make fill. Only the steel and the granite remain as the salvage residue."

"What is the economic point at which the tearing down of buildings becomes necessary?" Mr. Volk was asked.

"Various factors are involved," he answered. "Progress of commerce in that particular vicinity may play a part in spelling its doom. Its lay-out and construction and deterioration may warrant a new structure to keep abreast not only of the progress around it but also of competition. Another tremendously important factor is the increased value of space high up, where light and air are in abundance. The higher a building goes nowadays, the higher the rental. This might well be a determining factor and most usually is.

"On the other hand, a building may be a misfit in its particular setting. Take the old Pictorial Review Building, a twelve-story affair in the garment district. Here was a building out of place. It was surrounded by structures which housed tenants engaged in the garment industry. Its floors were constructed so that they could bear 250 pounds to the square foot. That was more than twice as much as would have been necessary for sewing and cutting machines in the garment business. After a brief life of ten years, the Pictorial Review plant was replaced by a 30-story structure for the garment trades.

"The high cost of taxes in a big city like New York often makes it cheaper to tear down an old building and put up a new one in its stead. Take the case of the discarded Fifth Avenue mansions, for instance. Those structures are fast vanishing. The rental from such enormous structures which have been abandoned for country estates or co-operative apartments would not even pay for the taxes.

"Therefore, prudent real estate operators have bought up practically every one of these mansions available, and one by one they are

(Continued on page 192)

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Smashing Down Skyscrapers

(Continued from page 190)

being levelled to make room for the rise of big apartment houses, for which there has been a persistent and constant demand in recent years.

"On the other hand, vast demolition work is sometimes due to engineering and railroad activity. In paving the way for the Manhattan approach to the Fort Lee bridge, which will link Manhattan and New Jersey, nearly 1,600 structures have been razed to make way for about 250 apartment houses, whose rents will be in keeping with the real estate boom which overran this section.

"Between the years of 1913 and 1922, about 6,000 buildings were torn down in New York City. For the year of 1930, up to last Fall, over 3,000 structures were demolished.

"For every year since the war the average amount of contracts awarded for building demolition in New York City has been $5,000,000. This year there has been a slump, not out of line with general business depression, and it is not likely that the contracts will amount to more than $1,500,000.

"It is also interesting to note that $5,000,000 in wrecking contracts during the past five years represents an annual destruction and demolition by the wreckers of $50,000,000 in buildings each year. Although the figures do not apply strictly in every instance, generally speaking, a building which is built today at a cost of $200,000 will require $20,000 to tear down.

"One of the costliest buildings to wreck was the old Waldorf-Astoria Hotel. That was a $500,000 contract. Speed was a telling factor there also, as the interests which former Gov. Alfred E. Smith represented were anxious to get started on the Empire State Building. I consider that the wreckers did mighty well in getting $150,000 worth of salvage out of the old hotel.

"On the other hand, the salvage in that instance also included furnishings and other appurtenances which might be refurbished and re-installed in other hotels. However, the greater amount of that $150,000 was derived from the steel which it gave up.

"This particular cycle was completed by the erection of Al Smith's Empire State Building intended to fill the needs of a revived business area, it having changed its complexion with the flight of years.

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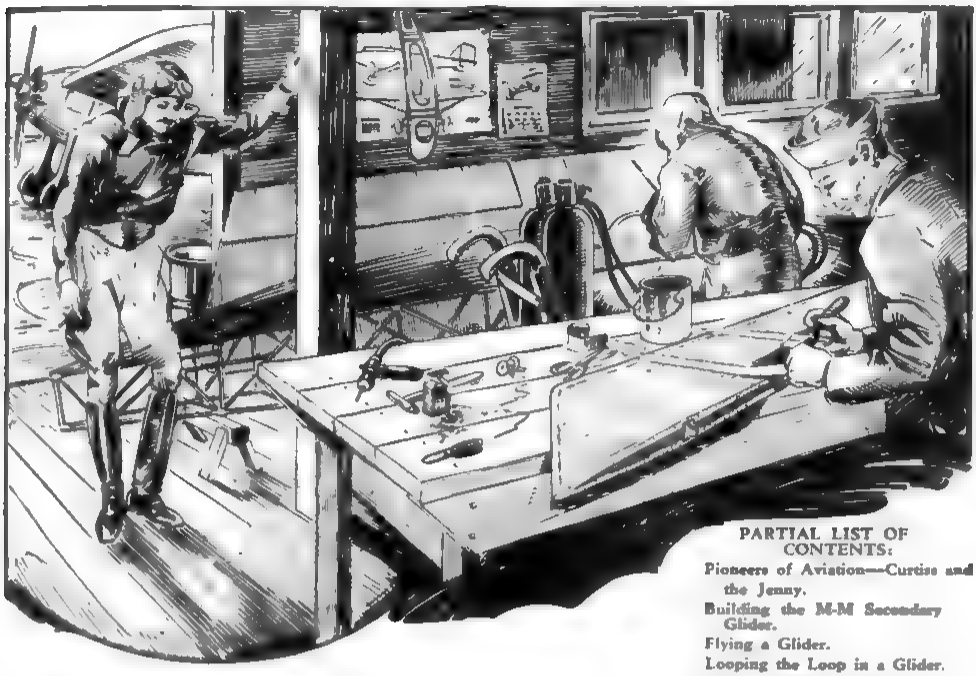

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Unsolved Mysteries of the Sea

(Continued from page 64)

year, and the total for all the sea faring nations probably is not less than 25 mysterious disappearances a year—and this in spite of the age of wireless.

Perhaps some explanation for these baffling mysteries can be found in the traditions which serve as guides of conduct for seamen in times of disaster. In recent years the chronicler of the daring deeds of seafaring men has often noted down exploits of skippers who have executed great rescues, and also of those helmsmen who have abided by the unwritten law of the sea and sacrificed their lives rather than return to their native ports minus the ships entrusted to their command.

Not so long ago a Swedish steamer, sailing the South Baltic Sea, dropped out of sight, so to speak. Ten days passed and no word was heard from her. The days dragged into months, and still her destiny or fate remained a mystery.

In such cases the historian assumes that either the boat and its crew perished, helplessly, at the hands of some big catastrophe, or that the men on board made their sacrifice with Spartan fortitude, going bravely to their deaths rather than forsake their craft.

In recent months such calamities have produced the questions: Why must the captain be the last one off the ship? Should a captain go down with his ship? Is such a climax to a captain's life heroism or folly, heroic or foolish?

Right after Captain George Fried, of the United States Lines ship, "America", returned from assisting in the rescue of the crew of "Ovidia", a Swedish freighter, off Cape Race, last November, I asked him what he thought of those questions.

Capt. Fried, whose fame as a sea hero is world-wide through his celebrated heroism in the "Antinoe" and "Florida" rescues, hesitated, mused, arched his rugged brows, and pondered for another moment.

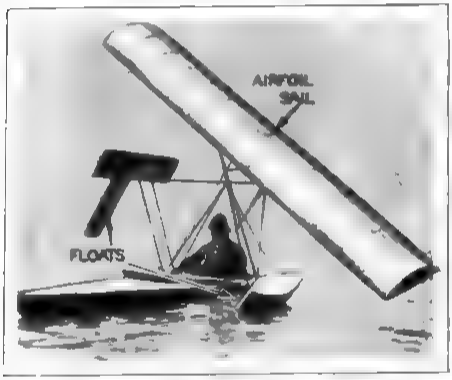
True to the code of a genuine hero, Capt. Fried's reply was brief.

"That has been the law of the sea from time immemorial. What would become of a ship if the captain proved weak? Just think where we'd be. It is something that has always been and will always be. It had no beginning. It will have no end."

On the other hand, a different version drops from the lips of that renowned British seaman, Commander F. G. Cooper, of the Royal Naval Forces. Commander Cooper was aroused to comment on the foolhardiness of the ancient tradition among navigators following the destruction not long ago of the German motorship, "Monte Cervantes", in the Straits of Magellan.

"In war and in peace," said Commander Cooper, "to seek death when it can be avoided with honor is suicide. There are circumstances when it would be morally a braver act on the part of the captain if he took means to save himself, and so be able to assist at subsequent legal proceedings, probably to the benefit of his employers or the insurance underwriters, or both."

Novel Boat Has Airfoil Sail



Pontoons prevent this boat from being sunk.

AN UNSINKABLE sailing boat equipped with a novel sail in the shape of an airfoil has been invented in London. The sail adapts to sail-boating some of the principles of aviation. The wind striking the airfoil sail has a tendency to lift the craft as well as drive it ahead. The odd appearing boat which is pictured above is also equipped with odd shaped pontoons which make it absolutely unsinkable. The pontoons extending out from each side have floats which extend down into the water giving the craft greater stability. The "T" shaped pontoons are reputed to be unusually safe although a somewhat greater resistance is offered by the larger surface. The new type of sailboat is admirably adapted to sports use by men who desire the unusual.

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29x4.50-21"		2.90	1.35
30x5.00-20"		2.90	1.35
29x5.00-19"		2.90	1.35
30x5.25-20"		2.90	1.35
31x5.25-21"		3.20	1.35
30x5.77-20"		3.20	1.40
31x6.00-19"		3.20	1.40
32x6.00-20"		3.20	1.40
33x6.00-21"		3.20	1.45
32x6.50-20"		3.65	1.75

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Size	Tires	Tubes
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30x3½	2.70	1.10
32x3½	2.70	1.10
31x4	2.90	1.15
32x4	2.90	1.15
33x4	2.90	1.15
34x4	2.90	1.15
32x4½	3.20	1.40
33x4½	3.20	1.40
34x4½	3.20	1.40
30x5	3.65	1.75
33x5	3.65	1.75
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Will Your New House Have "IT"?

(Continued from page 187)

appreciate this feature. A door leading from the hall to the deck of the garage permits extra sleeping quarters in the open, or a sleeping porch for summer service. In fact the house is so planned that a second bedroom may be built over the garage deck.

And there you have a brief statement of the outstanding features, except to say the house is frame construction with stucco on metal lath and a roof in wood shingle thatch effect. The interior walls may be large surface insulation boards treated with plastic paint or plastered if you prefer.

Estimates by Chicago builders suggest this house can be built in the suburbs of that city for around $5,500. This is a suggested price range only. The price will vary depending upon where and how you build. It may probably be less in most sections and in some it may be more.

The design No. 5-S-21, a house with a tower, is a style of the hour. Tower houses are becoming more and more popular. They are of Normandy parentage, and the tower adds a new note in small house design. It brings romance, a curved surface and variety into the picture, so to speak.

This house has plenty of "IT" qualities, too. Heavy beamed ceilings in living and dining rooms carry out old world tradition. A raised fireplace hearth and wood beam mantel is another interior feature. Casement windows maintain the spirit of old Normandy. Cedar shakes or asbestos shingles add the finishing touch to solidity that make the house appear to grow out of mother earth.

There are five rooms on the first floor, including two bedrooms and two additional bedrooms above. A 40-ft. lot will accommodate this house.

What about costs? The designer says a fair price range under normal conditions is $6,000 both ways—up and down. Certainly the little place looks like a miniature mansion. Either one of these houses will have charm, a fine plan, reasonable cost, and they abound in qualities of "IT".

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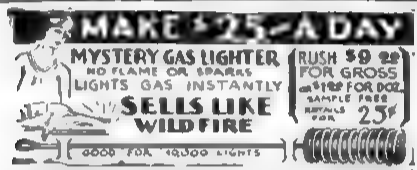

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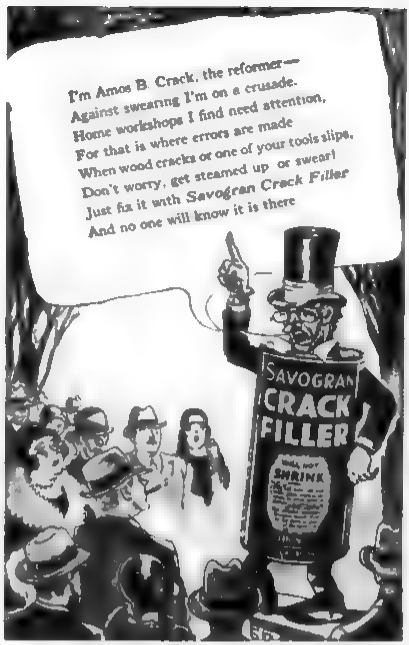

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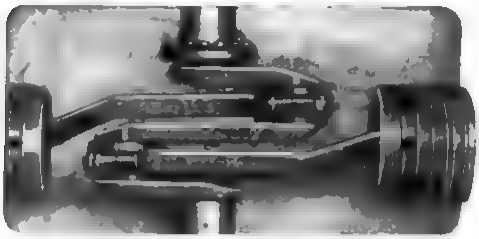

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31x4	3.70	1.15	29x4.75	2.45	1.20
32x4	3.80	1.15	28x4.75	2.45	1.20
33x4	3.85	1.15	30x4.95	2.50	1.25
34x4	3.90	1.15	29x5.00	2.50	1.25
32x4½	3.20	1.45	30x5.00	2.50	1.25
33x4½	3.20	1.45	29x5.25	2.55	1.30
34x4½	3.45	1.45	30x5.25	2.55	1.30
35x4½	3.45	1.75	31x5.25	2.55	1.30
33x5	3.60	1.75	30x5.77	2.70	1.40
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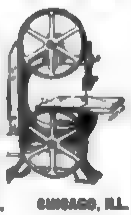

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What's Delaying Television?

(Continued from page 102)

in perfect synchronism. If your receiver is located in the same town as the transmitter, and both receive their motor power from the same electric light company the problem is not serious, for the two 60 cycle motors will operate at the same speed. But to get signals from a distant station and transform them into images it is necessary either to provide some means of manually correcting the speed from time to time, or else some electrical agency to do the same thing.

In one of the simplest kits, produced by the Jenkins Laboratories, the disc is driven by a rubber tip on the end of the motor shaft, and the motor itself can be moved back and forth by turning a screw feed. As the motor is moved outward from the disc center the disc naturally revolves at a slower rate, and as the motor moves inward it speeds up.

In another type of set, manufactured by the Jenkins Television Corporation—which has no connection with Mr. Jenkins' own laboratories beyond the fact that it uses his patents—synchronization is attained by filtering out a portion of the incoming signal, amplifying it, and using the product to operate a phonic motor, which keeps the receiver in exact step with the transmitter. If the system used at the broadcast end produces 15 pictures per second of 48 lines each, there will be a strong 720 cycle frequency present in the incoming signal—48 times 15 being 720. A special tube in the short wave receiver picks out this frequency and amplifies it.

For the receiving end, engineers of the Westinghouse Laboratories at East Pittsburgh have developed, after considerable experimental work, a television system which has no mechanical moving parts. The incoming signal is delivered to a cathode ray tube, releasing a stream of electrons which, due to a fluorescent material within the tube, appear as an image on the end of the tube. So far tubes with an end diameter of about nine inches are the largest that have been made. The electronic bombardment can be diverted from its path by a magnet. The sine wave sweeps the image across the tube horizontally, and a magnetic field is used to paint the picture in successive parallel lines. In television with a scanning disc or drum, the lines sweep always in one direction, but

(Continued on page 200)

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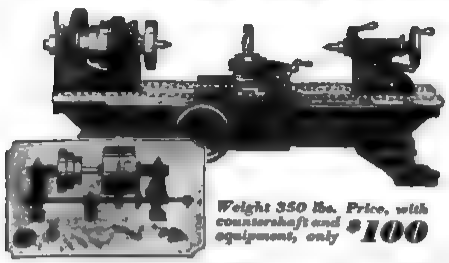

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RADIO TRAINING ASSOCIATION OF AMERICA
4513 Ravenswood Ave. Dept. MM-5 Chicago, Ill.

What's Delaying Television?

(Continued from page 198)

with the cathode tube the picture is painted both ways, as though you drew a pencil back and forth across a sheet of paper without lifting the point. With this system television has been produced with as many as 120 lines to the picture.

The fluorescent material used in the tube gives a bright green image, in marked contrast to the familiar pink or red glow of the neon tube used in other systems.

When the "big three" divided up their spheres of activity and assigned all entertainment features of radio and television to the RCA-Victor organization, the A. T. & T. retained the commercial development of wired pictures in connection with telephones, and the Bell Laboratories has recently demonstrated successful two-way television over the telephone wires.

While the apparatus is still in the laboratory stage, it is possible that it may be offered the public within another year or two as a special form of telephone communication. If that time comes, people wishing to both see and talk at long distances will make appointments in advance and appear at the set time at the nearest television stations, where the connection will be established, and they will then be seated in the booths. Telephone apparatus of the usual type is eliminated. A microphone concealed in the cabinet takes the place of the telephone transmitter, while the receiver is replaced by a loud speaker so situated that the voice seems to come from the lips of the image. The image size gives the appearance of a person about fifteen feet away, and the amplification in the loud speaker is regulated to that of a normal voice speaking at the same distance.

That is the status of television today. If you live most any place east of the Rockies you can pick up the signals of one of the nineteen existing stations located in Illinois, New York, New Jersey, Pennsylvania or Maryland. You can get interesting pictures and "grow up" with the new art, just as the original radio fans helped develop radio to what it is today. You can have your choice of home-built short wave receivers and televisors, or buy ready manufactured sets. If you want more information about specific sets, prices, etc., MODERN MECHANICS will be glad to tell you where to get it.

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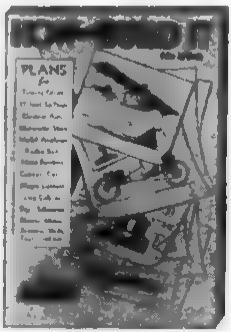

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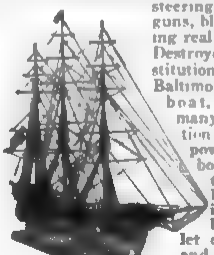

Model Ship Supply Co., Dept. X, Mineola, N. Y.

Crashing a Zeppelin for Fun

(Continued from page 79)

fights off all planes — but one. This one climbs high above the Zeppelin. The pilot's machine-gun jams. In heroic desperation, he dives his plane into the vitals of the Zeppelin. The giant dirigible buckles up with a broken back and bursts into flames.

How was it done? Part of this scene is a sample of exceptionally clever double exposure. A drawing explains. First, a miniature airplane is swung from a wire against a flat black back-ground. This is shot with a high-speed camera—about ten times normal. When reproduced at normal speed, this would represent a full-sized plane in the distance taking a power dive of several thousand feet.

The undeveloped negative of the miniature plane is rewound into the camera magazine, and a shot of the Zeppelin, moving slowly, is recorded on the same film. The composite picture is shown in the enlarged frame. The moment the airplane hits the Zeppelin the film is "cut," and the sequence of the picture is resumed when the Zeppelin is fired.

During part of the heroic dive toward the Zeppelin, seemingly the spectator is riding in the plane. This illusion was created in the hangar. The Zeppelin was suspended about half way between the roof and the floor, and the camera-man was lowered toward it. A miniature, pictorial set on the floor gave a suitable back-ground; the high-speed camera did the rest.

Now comes the big, breath-taking scene—the fall of the flaming Zeppelin. To make sure of suitable film, fourteen cameras shot the scene.

The covering of the gas bag is sprayed with kerosene. Everything is ready. Comes the director's cry: "Camera!" A special prop in the "in'ards" of the "Zep" is jerked out. The dirigible sags in the middle, and then bursts into flames. All the cameras are in action. The man at the electric winch slowly lowers the flaming hulk. It passes into and out of the range of the cameras. When the flaming wreck is about eight feet from the floor, it is dropped with a crash. To make the falling act very vivid, a pair of cameras are in a pit in the floor covered with plate glass, and shoot the vertical fall. And the fall of a burning Zeppelin from the skies is a celluloid record. In the cutting room, the best of the shots are compiled into the fin-

Crashing a Zeppelin for Fun

ished film which the spectator sees on the screen.

Be it said that all those in the hangar during the "fire" were not sorry when it was all over. The camera-men up on the cat-walk had no occasion to take a Turkish bath for six months.

"Hell's Angels" is an outstanding example of the far-reaching possibilities of the model technician's art. Because a real Zeppelin was not used, and the crew not incinerated in the fire, should not detract the spectator's interest in the picture. In the wild and wooly "westerners," one knows that the Indians are not really shot off their mustangs. But if they tumble off and "bite the dust" in realistic fashion, the spectators howl their delight.

For realism, "Hell's Angels" stands out alone in its class.

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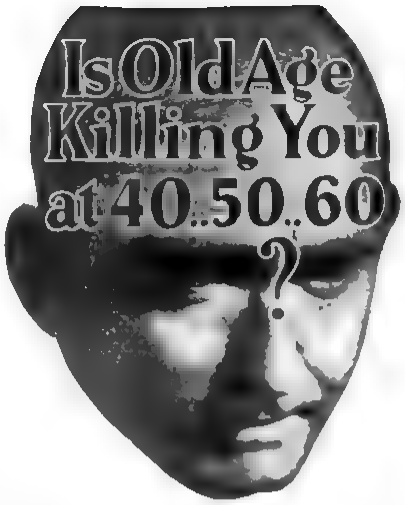

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Radium—Science's Servant

(Continued from page 154)

laboratory, offering their discoveries to the world without desire for recompense—their lives dedicated to science and humanity.

Radium is now the most rare and the most precious of metals. Consequently, it was a great relief when an American physicist, William Duane suggested the insertion of radon, the radium gas, into the tissues and leaving it there a number of years. It is one of radium's freak but beneficial properties that it does not injure normal tissues but destroys the diseased ones.

Uranium, and therefore radium, is found in this country in carnotite and its associated minerals, and in pitchblende. Carnotite is a lemon-yellow mineral, usually found in pockets of sandstone deposits. The mineral may be in the form of light yellow specks spread through the sandstone, or as yellow incrustations in the cracks of the sandstone.

Carnotite was first discovered on this continent in 1887 by a prospector named Charles Poulot, in western Montrose county, Colorado. There are other vast carnotite formations in southwestern Utah, 11,500 feet above the sea level, in high, arid and barren mountain regions. There are no roads to these Utah mines, only narrow, perilous paths which are traversed only by burro trains. There is no water there, nor any wild animals or vegetation for food. It is a ghastly region with the temperature over 100 at high noon, and sinking below zero at night.

The ore is hand-picked and packed in 80-pound sacks. A burro bears two of these bags down a precipitous mountain trail to a wagon road eleven miles away. The best that a skillful miner can do is two burro-loads a day. The ore is carried to an automobile highway, and finally reaches a railroad only to travel another 2,000 miles to a chemical plant.

A long, laborious process is used in the manufacture of radium from carnotite. Rather vaguely, the process has been compared with the methods used in the purification of table salt. This salt is placed in solution and the impurities driven off by crystallization.

However, this is child's play alongside the task of extracting radium from carnotite. The carnotite is placed in solution, and step by step the numerous other elements are driven off by crystallization, each step mak-

ing the radium purer. Here the preciousness of radium becomes evident when it is revealed that it takes from five to six hundred tons of carnotite ore to produce a single gram of radium.

At this point it may be appropriate to mention that in 1923 a gram of pure radium cost $120,000. The fact that this particular gram could "live" and keep its energy for 17,000 years did not offer much solace. Today, because of simplified methods of production, the market value of a gram is $70,000. This means that one ounce of radium would cost $1,960,000. The New York State Hospital at Buffalo recently bought $300,000 worth of radium at that rate. Its records show that 800 persons have been cured of cancer since its use there. The invention of radium emanation apparatus has helped the cause immensely.

The use of radium has by no means been confined to the field of therapeutics. Its services have been extended also to the field of structural engineering. Recently, with a bit of radium no larger than a .22 caliber bullet, three Washington, D. C. scientists startled the world by demonstrating that the powerful "gamma ray," derived from radium, can actually penetrate a ten-inch piece of steel, an accomplishment hitherto never realized.

The gamma ray is similar in use to the X-ray, but many times more powerful. Its all-revealing "eye" can see clear through the hull of the toughest battleship, thereby measuring strength, or revealing any structural defects that might be present.

This newest method of ray photography is the work of Dr. Robert F. Mehl and Chas. S. Barret, both of the Naval Research Laboratory, Washington, D. C., and Gilbert E. Doan, assistant professor of metallurgy at Lehigh University.

The mechanism of the gamma ray is simple in operation. With it, engineers simply need place a bit of radium into a little tube behind a steel casting of a bridge and a photographic plate attached to the casting will record the comparative soundness of the steel. Workmen can take pictures of the "insides" of a locomotive wheel, and a group of divers can determine the strength of a propeller strut on a man o' war before subjecting it to the tremendous pressure of the deep seas.

(Continued on page 206)

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Radium—Science's Servant

(Continued from page 205)

The chief advantage of radium is its simplicity. Very easily the technician can group the objects he wants to photograph, then simply drop the bit of radium into the tube before starting his morning's work on other projects. The radium rays will operate during the day and the technician can pick up his developed plates when he finishes in the evening.

An important phase of gamma light photography is its sensitivity. It will reveal defects as minute as two per cent of the material's thickness, a fact which indicates that it will be useful in testing heavy guns and metal gun turrets.

Certain Navy experts point out that a gamma ray picture or "radiograph," may properly be called a "textbook of metal defects," since it teaches the student of metal construction all he wants to know concerning the "insides" of a sheet of metal. Any defects stand out on the photographic film as dark spots or streaks, in contrast to the lighter background of the rest of the material, thus accurately portraying the features of the hitherto hidden cracks and voids.

An important industry which is constructing equipment on which a great deal depends requires complete information on the trustworthiness of the materials utilized. In the case of a modern power plant, defective material used for this purpose may result in the loss of hundreds of thousands of dollars and even in loss of life. By the use of radium, however, all these difficulties can be eliminated.

Midget Cars with Motors in Wheels

(Continued from page 87)

reaction are always equal, and, as the cylinder can not move, the power must be consumed as heat, and so we have cooling systems to carry it away.

But now imagine the mass of the earth getting smaller and smaller until eventually it is no greater than the mass of the piston. When you reach that point your mass on either side receives an equal impulse and your power is consumed as motion.

That is an explanation of why my reaction motor can operate on about half the fuel consumed by ordinary types, since it is only necessary to provide sufficient thermal units

as can, with one working stroke, be made to do useful work.

In my engine the outer of the two moving pistons is encased within the usual fixed cylinder, and, besides acting as a piston, works also somewhat in the same manner as the familiar sleeve valve. It has side ports in its upper and lower end, and the outer cylinder itself has an enlarged head into which the cylindrical piston projects at the top of the stroke. The combustion charge is admitted into the enlarged head by a valve which is held closed by a spring, but opens near the downward end of the stroke when the partial vacuum in the outer cylinder reaches a certain stage. A charge is thus admitted into the outer cylinder. When the outer of the two pistons reaches the top of its stroke (the inner one being at the bottom) the ports are opened to this charge, and it passes into the space between the two piston heads. On the compression stroke, the exhaust gases having escaped through the lower ports, the two pistons come together until the charge is ignited through the heat generated in its compression.

Among the advantages of the engine, aside from its greatly increased thermal efficiency, are the reduction in exhaust noises, absence of heavy cooling equipment, elimination of all ignition systems, elimination of valve gear, extremely light weight, practically triple efficiency with the same amount of fuel consumption.

Engine efficiency has not been a particularly pressing problem for automobile engineers, particularly in the United States, where gasoline prices have always been much below those charged on the continent. I understand, however, that rising gas prices, largely due to increasing gasoline taxes, which, I understand, are as high as five or six cents a gallon, have begun to make fuel economy an important consideration in selecting a car, just as lack of parking space and heavy traffic have opened a field in America for the small, light car. The big, heavy American car, with its high engine power and sturdy construction, was really a development based on lack of good roads, and, with paved highways now reaching over most of the continent, it may be that it will begin to give way to the small, light car which has proven so practical in England and on the continent.

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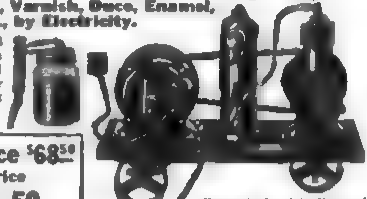

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Catching Big Fish

(Continued from page 138)

so rough he couldn't get the creature aboard. So, after killing his fish, he got a line on him, and towed him in. The rules of the game now clarify the fact that a fish towed ashore is a fish caught. The ethics of sportsmanship do not require the fish to be taken aboard the boat.

After the small boat method of catching big fish received wide press publicity, the popularity of such sport spread like the miniature golf craze. Record after record has been made and broken. The fish taken get bigger as the boats get smaller, and the locale has spread from California to Florida, and from Honolulu to the Panama Canal Zone. As these lines are written the record is held by a Honolulu fisherman who brought in a 400-pound ulua (giant mackerel) with a 200-pound boat powered by a 30-pound outboard motor.

While the Hawaiian fisherman holds the record for the biggest fish caught and towed ashore with the smallest boat, a Los Angeles angler has eclipsed his record for the largest catch of big fish, and the largest weight of catch made in a single day from a 12-foot, outboard motor driven boat. This latter angler, operating in the Gulf of California, went to sea from San Felipe with a "peanutty packet" weighing only 150 pounds, 12 feet in length, and powered with a 29-pound outboard motor. In six hours of fishing he caught 615 pounds of fish—the fish being three tortuavas (white sea bass), two of two hundred pounds each, and a third fish of 215 pounds. He towed his catch ashore, being unable to get it aboard the boat.

As the rivalry for catching the biggest fish from the smallest boat becomes keener, the fishing tackle and outboard motor manufacturers have taken cognizance of it as a new form of red-blooded, HE-man sport that bids fair to create a new sales field for their products. There are indications that a cash prize of $1000, and secondary prize of $500, $250, $100, and $50 will be posted for the anglers taking the largest fish from the smallest outboard motor driven boat during 1931.

There is, of course, a physical limit to which this contest may go, but it is obviously possible to catch bigger fish from smaller boats than any of the catches recorded. The adventures and the dangers of such fishing must increase as bigger fish are caught from smaller boats.

Camera Pictures That Live

(Continued from page 179)

Another lesson you will learn from your first few efforts is that "snapshots" are not always desirable. Usually short exposures, that is, 1/25 of a second or less, are made at large lens openings. That explains why that shot of Cousin Carey showed her in sharp focus, while Uncle Pete, a few feet farther away, was blurred almost beyond recognition. The remedy in a case like this is to move Uncle Pete to the same distance as Cousin Carey, or use a slower shutter speed and a smaller stop to get increased depth of focus.

There are a great many other tricks that you will learn from your first venture into photography. There is one condition that will gradually dawn upon you—that is the existence of two kinds of photographs. The first and most common is the record picture or the conventional snapshot. "Point the camera and push the button, then trust to the photo finisher," is the way it is made. Such pictures are all right when you merely wish to record an incident so you can recall it later. But you soon tire of such pictures, unless some unusual significance is attached to them.

The second kind is the picture that is pleasingly arranged, and that possesses some beauty or other quality that arouses emotion in the observer. In other words, it is the picture that the photographer thinks out before pressing the button, and one that he subsequently wants enlarged so that he and his friends can appreciate it better. The best way to learn how to make such pictures is to study the works of famous artists, observing how they arrange objects in the picture space, how the lighting is controlled and the expressions of the subjects. These artists need not be "old masters". Today, there are hundreds of pictures, made by photographer-artists, to be seen in the magazines, in rotogravure sections, in photographic journals and elsewhere.

Considerable space has been given to the part of amateur photography that many persons think preliminary. But the handling of your camera is the real foundation of your success. Next comes the interesting work of developing your film and making your own prints, but that will have to wait until next month.

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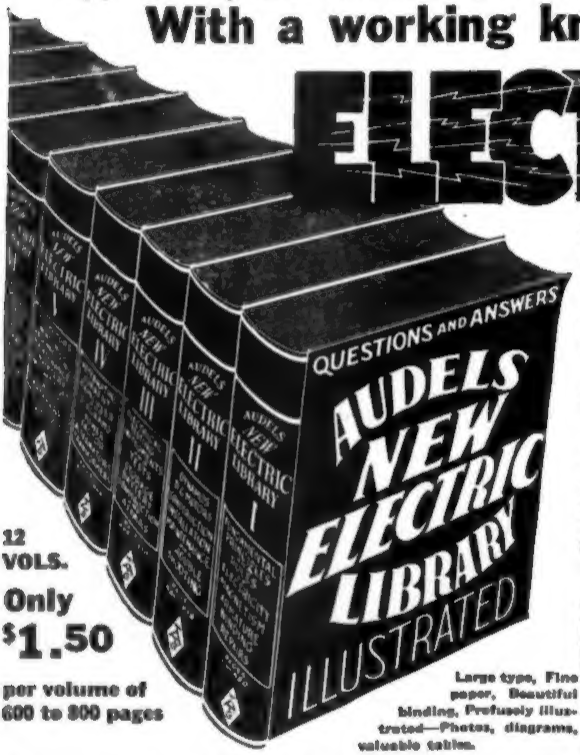

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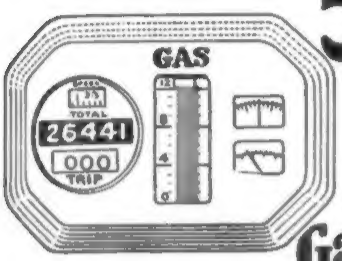

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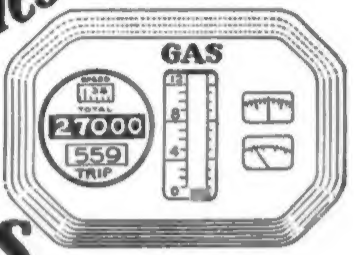

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